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U.S. ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

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Preface

Included in this issue is a list of sources from which at least one article was abstracted for publication in either Volume 7 (1974) or Volume 8 (1975); however, more than 2500 primary serials and secondary sources, books, and non-periodical publications are screened. Journal titles are abbreviated according to the format of *Chemical Abstracts Service Source Index Quarterly* (CASSI). Japanese publications are listed by the Hepburn romanization of the complete title which is followed by the English equivalent, abbreviated according to CASSI, in parentheses. For additional convenience, English titles of Japanese periodicals are listed separately and cross-referenced.

ACTA AGRIC SCAND
ACTA AGRON (PALMIRA)
ACTA BIOL MED GER
ACTA BOT
ACTA EMBRYOL EXP
ACTA ENTOMOL BOHEMOSLOV
ACTA HAEMATOL
ACTA HEPATO-GASTROENTEROL
ACTA HISTOCHEM
ACTA HORTIC (THE HAGUE)
ACTA MED IUGOSL
ACTA MICROBIOL POL
ACTA MORPHOL ACAD SCI HUNG
ACTA NEUROPATHOL
ACTA PARASITOL POL
ACTA PATHOL JPN
ACTA PHARM HUNG
ACTA PHARMACOL TOXICOL
ACTA PHYSIOL ACAD SCI HUNG
ACTA PHYSIOL POL
ACTA PHYSIOL SCAND
ACTA PHYTOPATHOL
ACTA POL PHARM
ACTA VET (BRNO)
ACTA VET (BUDAPEST)
ACTA VET SCAND
ACTIV NERV SUPER
ADV AGRON
ADV APPL MICROBIOL
ADV INTERN MED
AEROSP MED
AGRIC AM
AGRIC AVIAT
AGRIC BIOL CHEM (TOKYO)
AGRIC CHEM MON SEE KONGETSU NO NOYAKU
AGRIC N IREL
AGRIC RES
AGRICHEM AGE
AGROCHEMIA (PRAGUE)
AGROCHIMICA
AGROKEM TALAJTAN
AGROKHIMIYA
AGRON J
AICHE SYMP SER
AIN SHAMS MED J
AKAD WISS LIT MAINZ ABH MATH-NATURWISS KL
AKITA J RURAL MED SEE AKITA-KEN NOSON IGAKKAI ZASSHI
AKITA-KEN NOSON IGAKKAI ZASSHI SEE AKITA J RURAL MED
AKUSH GINEKOL (SOFIA)
ALIMENT VIE
ALLG FORST JAGDZTG
ALLG FORSTZ
AM BEE J
AM CHEM SOC DIV WATER AIR WASTE CHEM GEN PAP
AM FAM PHYSICIAN
AM IND HYG ASSOC J
AM J DIS CHILD
AM J ENOL VITIC
AM J PATHOL
AM J PHYSIOL
AM J PSYCHIATRY
AM J TROP MED HYG
AM J VET RES
AM MIDL NAT
AM REV RESPIR DIS
AM ZOOL
AMBIO
AN QUIM
ANAL BIOCHEM
ANAL CHEM
ANAL CHIM ACTA
ANAL INSTRUM
ANAL LETT
ANALYSIS
ANALYST (LONDON)
ANAT REC
ANDHRA AGRIC J
ANGEW CHEM INT ED ENGL
ANN ACFAS (ASS CAN FR AVAN SCI)
ANN AGRIC FENN
ANN APPL BIOL
ANN BIOL ANIM BIOCHIM BIOPHYS
ANN FALSIF EXPERT CHIM
ANN HYDROBIOL
ANN INT MED
ANN MED VET
ANN N Y ACAD SCI
ANN NUTR ALIMENT
ANN OPHTHALMOL
ANN PEDIATR SEE SEM HOP
ANN TROP MED PARASITOL
ANN ZOOL ECOL ANIM
ANN ZOOL FENN
ANNEE ENDOCRINOL
ANNU REP KANAGAWA PREFECT PUBLIC HEALTH LAB
  SEE KANAGAWA-KEN EISEI KENKYUSHO NENPO
ANNU REP SANKYO RES LAB SEE SANKYO KENKYUSHO NENPO
ANNU REP SHIMANE PREFECT INST PUBLIC HEALTH
  SEE SHIMANE-KEN EISEI KENKYUSHO NENPO
ANNU REP SOC YAMAGUCHI IND HEALTH
  SEE YAMAGUCHI SANGYO IGAKU NENPO
ANNU REP TOKYO METROP LAB MED SCI
  SEE TOKYO-TORITSU EISEI KENKYUSHO NENPO
ANNU REP TOKYO METROP LAB PUBLIC HEALTH
  SEE TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
ANNU REP WAKAYAMA PREFECT INST PUBLIC HEALTH
  SEE WAKAYAMA-KEN EISEI KENKYUSHO NENPO
ANNU REP YAMAGUCHI PREFECT RES INST
  SEE YAMAGUCHI-KEN EISEI KENKYUSHO NENPO
ANNU REP YAMANASHI PREFECT INST PUBLIC HEALTH
  SEE YAMANASHI KENRITSU EISEI KENKYUSHO NENPO
ANNU REV BIOCHEM
ANNU REV PHARMACOL
ANNU REV PLANT PHYSIOL
ANTONIE VAN LEEUWENHOEK
ANZ SCHAEDLINGSKD PFLANZEN-UMWELTSCHUTZ
APIDOLOGIE
APPL ENTOMOL ZOOL
APPL MICROBIOL
ARCH BIOCHEM BIOPHYS
ARCH DERMATOL
ARCH ENVIRON CONTAM TOXICOL
ARCH ENVIRON HEALTH
ARCH EXP VETERINAERMED
ARCH GESCHWULSTFORSCH
ARCH INST CARDIOL MEX
ARCH INT PHARMACODYN THER
ARCH INT PHYSIOL BIOCHIM
ARCH KLIN EXP DERMATOL
ARCH MAL PROF MED TRAV SECUR SOC
ARCH MIKROBIOL
ARCH PATHOL
ARCH PHARM (WEINHEIM GER)
ARCH TOXIKOL
ARCH UNION MED BALK
ARCH VET
ARCH VET ITAL
ARCTIC

ARH HIG RADA TOKSIKOL
ARKH ANAT GISTOL EMBRIOL
ARQ INST BIOL (SAO PAULO)
ASIAN MED J
ATMOS ENVIRON
ATTI SOC ITAL SCI VET
AUK
AUST J BIOL SCI
AUST J DAIRY TECHNOL
AUST J EXP AGRIC ANIM HUSB
AVIAN DIS
BECKMAN REP
BEE WORLD
BEHAV BIOL
BEITR GERICHTL MED
BEITR TABAKFORSCH
BERUFS-DERMATOSEN
BIOCHEM BIOPHYS RES COMMUN
BIOCHEM J
BIOCHEM PHARMACOL
BIOCHEMISTRY
BIOCHEMISTRY (TOKYO) SEE SEIKAGAKU
BIOCHIM BIOPHYS ACTA
BIOKHIMIYA
BIOL CONSERV
BIOL GLAS
BIOL NAUKI
BIOL RUNDSCH
BIOLOGIA
BIOLOGICO
BIOSCIENCE
BITKI KORUMA BUL
BIUL INST OCHR ROSL
BIUL WARZYWNICZY
BOCHU-KAGAKU SEE SCI PEST CONTROL
BODENKULTUR
BOEI EISEI SEE NATL DEF MED J
BOL ASSOC MED P R
BOL OF SANIT PANAM
BOLL LAB CHIM PROV
BORGYOGY VENEROL SZ
BR J ANAESTH
BR J CLIN PRACT
BR J DERMATOL
BR J EXP PATHOL
BR J HAEMATOL
BR J IND MED
BR J PHARMACOL
BR J PREV SOC MED
BR MED J
BR POULT SCI
BR VET J
BRAIN NERVE SEE NO TO SHINKEI
BRAIN RES
BRATISL LEK LISTY
BROMATOL CHEM TOKSYKOL
BRUXELLES-MED
BUDAPESTI KOZEGISZEGUGY
BULL ACAD NATL MED PARIS
BULL ACAD POL SCI
BULL ACAD VET FR
BULL AGRIC CHEM INSP STN SEE NOYAKU KENSASHO HOKOKU
BULL CHEM SOC JPN
BULL ENTOMOL RES
BULL ENVIRON CONTAM TOXICOL
BULL EXP BIOL MED (USSR)
BULL GRAIN TECHNOL
BULL INST PUBLIC HEALTH (TOKYO)
BULL KAGAWA PREFECT AGRIC EXP STN
  SEE KAGAWA-KEN NOGYO SHIKENJO KENKYU HOKOKU
BULL KANAGAWA PUBLIC HEALTH LAB
  SEE KANAGAWA-KEN EISEI KENKYUSHO KENKYU HOKOKU
BULL MAR SCI
BULL MT DESERT ISL BIOL LAB
BULL PHYSIO-PATHOL RESPIR
BULL SOC CHIM FR
BULL SOC FR DERMATOL SYPHILIGR
BULL SOC ZOOL FR
BULL TRAV SOC PHARM
BULL WHO
BUNDESGESUNDHEITSBLATT
BUNSEKI KAGAKU SEE JPN ANAL
BUR SPORT FISH WILDL SPE SCI RE
BUR SUGAR EXP STN QUEENSL
BYULL EKSP BIOL MED
C R HEBD SEANCES ACAD SCI PARIS SER D
C R SEANCES ACAD AGRIC FR
C R SEANCES SOC BIOL SES FIL
CALIF AGRIC
CALIF FISH GAME
CALIF MAR RES COMMUN
CAN ENTOMOL
CAN FIELD-NAT
CAN FOR SERV CHEM CONTR RES INS
CAN HOSP
CAN INST FOOD TECHNOL J
CAN J BIOCHEM
CAN J COMP MED
CAN J GENET CYTOL
CAN J MICROBIOL
CAN J PHYSIOL PHARMACOL
CAN J PLANT SCI
CAN J PUBLIC HEALTH
CAN J SOIL SCI
CAN J SPECTROSC
CAN J ZOOL
CANCER
CANCER (TOKYO) SEE GANN
CANCER CHEMOTHER REP
CANCER RES
CARBON (OXFORD)
CASE HIST SEE KARUTE
CENT AFR J MED
CEREAL CHEM
CEREAL SCI TODAY
CESK DERMATOL
CESK FYSIOL
CESK HYG
CEYLON MED J
CHEM AGE INDIA
CHEM ANAL (WARSAW)
CHEM-BIOL INTERACT
CHEM BR
CHEM CHEM IND (OSAKA) SEE KAGAKU TO KOGYO (OSAKA)
CHEM CHEM IND (TOKYO) SEE KAGAKU TO KOGYO (TOKYO)
CHEM CONTR RES INST REP
CHEM ENG (LONDON)
CHEM ENG NEWS
CHEM IND (LONDON)
CHEM IND (TOKYO) SEE KAGAKU KOGYO
CHEM LISTY
CHEM PAP PROCESS
CHEM PHARM BULL
CHEM PRUM
CHEM RUNDSCH
CHEM TECH (AMSTERDAM)
CHEM TECH (LEIPZIG)
CHEM UNSERER ZEIT
CHEM WEEKBL
CHEM ZVESTI
CHEM-ZTG CHEM APPAR
CHEMISTRY
CHEMOSPHERE
CHEMOTHERAPY (TOKYO)
  SEE NIPPON KAGAKU RYOHAGAKUKAI ZASSHI
CHEST
CHIM ACTUAL
CHIMIA
CHIN MED J
  SEE CHUNG-HUA I HSU EH TSA CHIH HAI HEN PAN
CHIRURGIE
CHIRYO SEE J THER
CHROMATOGRAPHIA
CHUNG-HUA I HSU EH TSA CHIH HAI
CLIN BIOCHEM
CLIN CHEM
CLIN CHIM ACTA
CLIN ELECTROENCEPHALOGR SEE RINSHO NOHA
CLIN PEDIATR
CLIN PHARMACOL THER
CLIN RADIOL
CLIN RES
CLIN TOXICOL
COEUR MED INTERNE
COLLECT CZECH CHEM COMMUN
COMMUNITY HEALTH (BRISTOL)

COMP BIOCHEM PHYSIOL
COMP GEN PHARMACOL
COMPOST SCI
CONCOURS MED
CONDOR
CONGENITAL ANOMALIES SEE SENTEN IJO
CONTRIB IST RIC AGRAR MILAN
COPEIA
CORNELL VET
CRIT REV ENVIRON CONTROL
CRIT REV FOOD TECHNOL
CRIT REV TOXICOL
CROP SCI
CROPS SOILS MAG
CURR FARM ECON
CURR SCI
CYTOBIOS
CZAS STOMATOL
DEV IND MICROBIOL
DISS ABSTR INT B
DOKL AKAD NAUK SSSR
DOKL BOLG AKAD NAUK
DOKL BIKH AKAD SOFIA
DOKL TSKHA
DOKL VSES AKAD BIKH NAUK
DOPOV AKAD NAUK UKR RSR SER B
DOWN EARTH
DRUG METAB DISPOS
DTSCH GESUNDHEITSWES
DTSCH GEWASSERKD MITT
DTSCH LEBENSM=RUNDSCH
DTSCH MED WOCHENSCHR
DTSCH TIERAERZTL WOCHENSCHR
EAST AFR MED J
ECON MED ANIM
ECON PLANN
EGESZSEGTUDOMANY
EHIME=KENRITSU EISEI KENKYUSHO (REP EHIME PREFECT HYG
EISEI KAGAKU (J HYG CHEM)
EISEI SHIKENJO HOKOKU (BULL NATL INST HYG SCI)
EIYO TO SHOKURYO (FOOD NUTR)
EKSP MED MORFOL
EKSP VOD TOKSIKOL MATER VSES SIMP
ELECTROENCEPHALOGR CLIN NEUROPHYSIOL
ELELMISZERVIZSGALATI KOZL
EMERG MED
ENDOCRINOLOGY
ENVIRON BIOL
ENVIRON CREATION SEE KANKYO SOZO
ENVIRON ENTOMOL
ENVIRON HEALTH PERSPECT
ENVIRON LETT
ENVIRON PHYSIOL BIOCHEM
ENVIRON POLLUT
ENVIRON POLLUT MANAGE
ENVIRON QUAL MAG
ENVIRON RES
ENVIRON SCI TECHNOL
ENVIRONMENT
ERNAEHRUNGSFORSCHUNG
ESSAYS TOXICOL
EUR J IMMUNOL
EUR J PHARMACOL
EUR J TOXICOL SEE J EUR TOXICOL
EURO=SPECTRA
EXP AGRIC ANIM HUSB
EXP CELL RES
EXP EYE RES
EXP MOL PATHOL
EXP PARASITOL
EXP PATHOL
EXPERIENTIA
FACHLICHE MITT OESTERR TABAKREGIE
FAINKEMIKARU (FINE CHEM)
FAO AQUACULT BULL
FAO PLANT PROT BULL
FARM CHEM
FARM ZH (KIEV)
FARMACO ED PRAT
FARMACO (ED SCI)
FARMAKOL TOKSIKOL (MOSCOW)
FARMATSIYA (MOSCOW)
FARUMASHIA (PHARMACY)
FDA (FOOD DRUG ADM) PAP
FEBS LETT
FED PROC FED AM SOC EXP BIOL
FETTE SEIFEN ANSTRICHM
FINE CHEM SEE FAINKEMIKARU
FIRE COMMAND
FISH BULL
FIZIOL AKT VESHCHESTVA
FIZIOL BIOKHIM KULIT RAST
FIZIOL NORM PATOL
FIZIOL ZH (KIEV)
FLEISCHWIRTSCHAFT
FLUORIDE
FOLIA BIOL (PRAGUE)
FOLIA ENDOCRINOL JPN
  SEE NIPPON NAIBUNPI GAKKAI ZASSHI
FOLIA ENTOMOL MEX
FOLIA MED (NAPLES)
FOLIA MED (PLOVDIV)
FOLIA MED BIALOSTOC
FOLIA MED CRAKOV
FOLIA MORPHOL (WARSAW)
FOLIA OPHTHALMOL JPN SEE NIPPON GANKA KIYO
FOLIA PHARMACOL JPN SEE NIPPON YAKURIGAKU ZASSHI
FOOD COSMET TOXICOL
FOOD DRUG COSMET LAW J
FOOD NUTR SEE EIYO TO SHOKURYO
FOREST CHEM SEE RINGYO TO YAKUZAI
FOREST PHARM SEE RINGYO TO YAKUZAI
FORTSCHR WASSERCHEM IHRER GRENZGEB
FRESENIUS Z ANAL CHEM
FRONTIERS
G IG MED PREV
GANKA RINSHO IHO (JPN REV CLIN OPHTHALMOL)
GANN (CANCER)
GARTENBAU
GARTENBAUWISSENSCHAFT
GAS WASSER ABWASSER
GAS=WASSERFACH WASSER=ABWASSER
GASTROENTEROLOGY
GAZ MED FR
GAZ WODA TECH SANIT
GENETICS
GENETIKA
GESUNDE PFLANZ
GESUNDH=ING
GETREIDE MEHL
GEWAESSERSCH WASSER ABWASSER
GIDROBIOL ZH
GIG SANIT
GIG TR PROF ZABOL
GIT FACHZ LAB
GRASAS ACEITES (SEVILLE)
GROUND WATER
HAREFUAH
HARYANA AGRIC UNIV J RES
HAUTARZT
HERBA POL
HIDROBIOLOGIA
HIPPOKRATES
HIROSAKI IGAKU (HIROSAKI MED J)
HIROSAKI MED J SEE HIROSAKI IGAKU
HISTOCHEMISTRY
HOKKAIDORITSU EISEI KENKYUSHO=HO
  (REP HOKKAIDO INST PUBLIC HEALTH)
HOPPE=SEYLERS Z PHYSIOL CHEM
HORTSCIENCE
HRANA ISHRANA
HUM HYG SEE MINZOKU EISEI
HUMANGENETIK
HWAHAK KWA KONGOP UI CHINBO (PROGR CHEM CHEM IND)
HYDROBIOLOGIA
IEEE TRANS AEROSP ELECTRON SYST
IG MOD
IG SANIT PUBBLICA
IGAKU NO AYUMI (PROGR MED)
IGAKU TO SEIBUTSUGAKU (MED BIOL)
IGIENA
IIRS
ILL MED J
IND ALIMENT (PINEROLO ITALY)

IND ALIMENT AGRIC
IND MED SEE SANGYO IGAKU
INDIAN J AGRIC SCI
INDIAN J BIOCHEM BIOPHYS
INDIAN J EXP BIOL
INDIAN J IND MED
INDIAN J MED RES
INDIAN J MED SCI
INDIAN J PUBLIC HEALTH
INDIAN PEDIATR
INDIAN PHYTOPATHOL
INDIAN SCI CONGR ASSOC PROC
INDIAN VET J
INDIANA AGRIC EXP STN INSP REP
INGENIEURSBLAD
INQUINAMENTO
INT ARCH ARBEITSMED
INT BIODETERIOR BULL
INT CHEM ENG
INT CONF TRANSP ENVIRON 1 SEL PAP
INT DIG HEALTH LEGIS
INT J BIOCHEM
INT J CANCER
INT J ENVIRON ANAL CHEM
INT J ENVIRON STUD
INT J NEUROSCI
INT J PARASITOL
INT PEST CONTROL
INTERNIST
INTERVIROLOGY
INVEST PESQ
IRYO (MED TREAT)
ISOTOPENPRAXIS
ISR J MED SCI
IZV AKAD NAUK SSSR SER BIOL
IZV AKAD NAUK SSSR SER KHIM
IZV TIMIRYAZEV S!KH AKAD
J AGRIC CHEM SOC JPN SEE NIPPON NOGEI KAGAKU KAISHI
J AGRIC FOOD CHEM
J AGRIC SCI
J AGRIC SCI (TOKYO) SEE NOGYO GIJUTSU (TOKYO)
J AGRIC UNIV P R
J ALA ACAD SCI
J AM DIET ASSOC
J AM MED ASSOC
J AM MED WOMEN!S ASSOC
J AM OIL CHEM SOC
J AM PHARM ASSOC
J AM SOC CIV ENG
J AM SOC HORTIC SCI
J AM VET MED ASSOC
J AM WATER WORKS ASSOC
J ANIM SCI
J APPL CHEM BIOTECHNOL
J APPL ECOL
J AUST ENTOMOL SOC
J BIOCHEM (TOKYO)
J BIOL CHEM
J CELL BIOL
J CHROMATOGR
J CHROMATOGR SCI
J CLIN ENDOCRINOL METAB
J CLIN PHARMACOL J NEW DRUGS
J COMMUN DIS
J DAIRY SCI
J ECON ENTOMOL
J ELECTRON MICROSC
J ENVIRON HEALTH
J ENVIRON QUAL
J EUR TOXICOL
J EXP BOT
J FISH RES BOARD CAN
J FOOD HYG SOC JPN SEE SHOKUHIN EISEIGAKU ZASSHI
J FOOD SCI
J FOOD SCI TECHNOL (MYSORE)
J FORMOSAN MED ASSOC (T!AI=WAN I HSUEH HUI TSA CHIH)
J GEN APPL MICROBIOL
J GEN MICROBIOL
J GEN PSYCHOL
J HERED
J HYG CHEM SEE EISEI KAGAKU
J HYG EPIDEMIOL MICROBIOL IMMUNOL
J INDIAN ACAD FORENSIC SCI
J INDIAN CHEM SOC
J INDIAN SOC SOIL SCI
J INST ENG (INDIA)
J INVERTEBR PATHOL
J JPN ASSOC RURAL MED SEE NIPPON NOSON IGAKKAI ZASSHI
J JPN BIOCHEM SOC SEE SEIKAGAKU
J JPN INTERN MED SOC SEE NIPPON NAIKA GAKKAI ZASSHI
J JPN OIL CHEM SOC SEE YUKAGAKU
J JPN OPHTHALMOL SEE NIPPON GANKA KIYO
J JPN OPHTHALMOL SOC SEE NIPPON GANKA GAKKAI ZASSHI
J JPN SOC FOOD NUTR SEE EIYO TO SHOKURYO
J JPN SOC INTERN MED SEE NIPPON NAIKA GAKKAI ZASSHI
J KANS ENTOMOL SOC
J KURUME MED ASSOC SEE KURUME IGAKKAI ZASSHI
J MAR RES
J MAR TECHNOL SOC
J MED CHEM
J MED ENTOMOL
J MED SOC TOHO UNIV SEE TOHO IGAKKAI ZASSHI
J MILK FOOD TECHNOL
J N Y ENTOMOL SOC
J NAGOYA CITY UNIV MED ASSOC
  SEE NAGOYA=SHIRITSU DAIGAKU IGAKKAI ZASSHI
J NATL CANCER INST
J NEUROCHEM
J NEUROL NEUROSURG PSYCHIATR
J NIPPON MED SCH SEE NIPPON IKA DAIGAKU ZASSHI
J NUTR
J OCCUP MED
J PATHOL
J PEDIATR
J PEDIATR PRACT SEE SHONIKA SHINRYO
J PESTIC SCI SEE NOYAKU KAGAKU
J PHARM BELG
J PHARM PHARMACOL
J PHARM SCI
J PHARMACOL
J PHARMACOL EXP THER
J PHYS E
J PHYSIOL (LONDON)
J PHYSIOL SOC JPN SEE NIPPON SEIRIGAKU ZASSHI
J PRAKT CHEM
J R AGRIC SOC ENGL
J R COLL PHYSICIANS
J RADIOANAL CHEM
J RANGE MANAGE
J REPROD FERTIL
J RES US GEOL SURV
J S AFR VET MED ASSOC
J S C MED ASSOC
J SCI FOOD AGRIC
J SCI SOIL ANIM FERT JPN
  SEE NIPPON DOJO HIRYOGAKU ZASSHI
J SOC DAIRY TECHNOL
J SOIL SCI
J STEROID BIOCHEM
J STORED PROD RES
J SURG ONCOL
J THER SEE CHIRYO
J TROP MED HYG
J URBAN LIVING HEALTH ASSOC SEE SEIKATSU EISEI
J WASH ACAD SCI
J WATER POLLUT CONTROL FED
J WILDL MANAGE
J ZOO ANIM MED
J ZOOL
JARQ (JPN AGRIC RES Q)
JIKKEN DOBUTSU (EXP ANIM)
JPN AGRIC RES Q SEE JARQ
JPN ANAL SEE BUNSEKI KAGAKU
JPN J AGRIC SCI SEE NOGYO GIJUTSU
JPN J APPL ENTOMOL ZOOL
  SEE NIPPON OYO DOBUTSU KONCHU GAKKAI=SHI
JPN J CLIN MED SEE NIPPON RINSHO
JPN J CLIN OPHTHALMOL SEE RINSHO GANKA
JPN J ENDOCRINOL
  SEE NIPPON NAISUMPI GAKKAI ZASSHI
JPN J HYG SEE NIPPON EISEIGAKU ZASSHI
JPN J IND HEALTH SEE SANGYO IGAKU
JPN J IND HYG SEE RODO EISEI
JPN J LEG MED SEE NIPPON HOIGAKU ZASSHI

JPN J OPHTHALMOL SEE NIPPON GANKA KIYO
JPN J OPHTHALMOL SOC SEE NIPPON GANKA GAKKAI ZASSHI
JPN J PHARMACOL SEE NIPPON YAKURIGAKU ZASSHI
JPN J PUBLIC HEALTH SEE NIPPON KOSHU EISEI ZASSHI
JPN J ZOOTECH SCI SEE NIPPON CHIKUSAN GAKKAI=HO
JPN MED J SEE NIPPON IJI SHINPO
JPN PESTIC INFORM
JPN PLANT PROTECT SEE SHOKUBUTSU BOEKI
JPN RADIOISOTPE ASSOC NEWS
SEE NIPPON HOSHASEI DOIGENSO KYOKAI NYUSU
JPN REV CLIN OPHTHALMOL SEE GANKA RINSHO IHO
JUGOSL INDSTR DOK ZAST RADU
KAGAKU (TOKYO) (SCIENCE)
KAGAKU KOGYO (CHEM IND (TOKYO))
KAGAKU TO KOGYO (OSAKA) (CHEM CHEM IND) (OSAKA)
KAGAKU TO KOGYO (TOKYO) (CHEM CHEM IND) (TOKYO)
KAGAWA=KEN NOGYO SHIKENJO KENKYU HOKOKU
(BULL KAGAWA PREFECT AGRIC EXP STN)
KANAGAWA=KEN EISEI KENKYUSHO NENPO
(ANNU REP KANAGAWA PREFECT PUBLIC HEALTH LAB)
KANGYO SOZO (ENVIRON CREATION)
KANSAI BYOCHUGAI KENKUKAI=HO (PROC KANSAI PLANT PROTEC
KANTO TOSAN BYOGAICHU KENKYUKAI NENPO
(PROC KANTO TOSAN PLANT PROTECT SOC)
KARUTE (CASE HIST)
KEM IND
KERTESZETIEGY KOZL
KHIG ZDRAVEOPAZ
KHIM IND (SOFIA)
KHIM SEL!SK KHOZ
KIEL MILCHWIRTSCH FORSCHUNGSBER
KISERL ORVOSTUD
KITAKANTO IGAKU (KITAKANTO MED J)
KITAKANTO MED J SEE KITAKANTO IGAKU
KLIN MED (MOSCOW)
KLIN WOCHENSCHR
KONGETSU NO NOYAKU (AGRIC CHEM MON)
KONSERVN OVOSHCHESUSH PROM
KOSHU EISEI JOHO (PUBLIC HEALTH INFORM)
KOSMOS (WARSAW) SER A
KURUME IGAKKAI ZASSHI (J KURUME MED ASSOC)
LA AGRIC
LAB ANIM
LAB ANIM SCI
LAB DELO
LAB INVEST
LAB PRACT
LABDEV PART B
LAEKARTIDNINGEN
LAIT
LANCET
LANDBOUWKD TIJDSCHR
LANDWIRTSCH FORSCH
LANTBRUKSHOEGSK MEDD SER A
LIFE SCI PART II
LIPIDS
MACDONALD J
MADRAS AGRIC J
MAGY ALLATORV LAPJA
MANITOBA ENTOMOL
MAR BIOL
MAR POLLUT BULL
MARSEILLE MED
MATER BADAN INST GOSPOD NODNEJ
MED BIOL SEE IGAKU TO SEIBUTSUGAKU
MED J AUST
MED KLIN (MUNICH)
MED LAV
MED MONATSSCHR
MED PARAZITOL PARAZIT BOLEZNI
MED PR
MED REP NAKADORI HOSP
MED TREAT SEE IRYO
MED TRIAL TECH Q
MED METER
MED WORLD NEWS
MED ZH UZB
MEDED FAC LANDBOUWHET RIJKSUNIV GENT
MEDICAMENTA
MELD NORG LANDBRUKSHOEGSK
MICROBIOL ESP
MIE IGAKU (MIE MED SCI)
MIE MED SCI SEE MIE IGAKU
MIKROBIOL ZH (KIEV)
MIKROCHIM ACTA
MILCHWIRTSCH BER BUNDESANST MOLKPASSING ROTHOLZ
MILCHWISSENSCHAFT
MINN MED
MINN UNIV AGRIC EXT SERV BULL
MINZOKU EISEI (HUM HYG)
MISS AGRIC FOREST EXP STN
MISS FARM RES
MITT BIOL BUNDESANST LAND=FORSTWIRTSCH BERLIN=DAHLEM
MITT DTSCH PHARM GES
MITT GEB LEBENSMITTELUNTERS HYG
MO MED
MOD KEMI
MOL GEN GENET
MOL PHARMACOL
MOL PHYS
MONATSH VETERINAERMED
MONATSSCHR KINDERHEILK
MONATSSCHR OHRENHEILK LARYNGO=RHINOL
MOSG NEWS
MUTAT RES
N ENGL J MED
N Y FISH GAME J
N Y STATE ASSOC MILK FOOD SANIT ANNU REP
N Z J AGRIC
N Z J AGRIC RES
N Z J EXP AGRIC
NACHRICHTENBL DTSCH PFLANZENSCHUTZDIENSTES (BRAUNSCHWE
NACHRICHTENBL PFLANZENSCHUTZDIENST DDR
NAGOYA MED J
NAGOYA=SHIRITSU DAIGAKU IGAKKAI ZASSHI
(J NAGOYA CITY UNIV MED ASS)
NAHRUNG
NAT CLGH POISON CONTROL CENT BULL
NAT HIST
NATL DEF MED J SEE BOEI EISEI
NATURE (LONDON)
NATURWISSENSCHAFTEN
NAUCHNI TR VISSH MED INST SOFIA
NAUNYN=SCHMIEDEBERGS ARCH PHARMAKOL
NAVAL RES
NEMATOLOGICA
NEPHRON
NETH MINIST SOC AFF DIR GEN
NIPPON BYORI GAKKAI KAISHI (TRANS SOC PATHOL JPN)
NIPPON CHIKUSAN GAKKAI=HO (JPN J ZOOTECH SCI)
NIPPON DOJO=HIRYOGAKU ZASSHI (J SCI SOIL ANIM FERT JPN
NIPPON EISEIGAKU ZASSHI (JPN J HYG)
NIPPON GANGAKKAI KIJI (PROC JPN CANCER ASSOC)
NIPPON GANKA GAKKAI ZASSHI (J JPN OPHTHALMOL SOC)
NIPPON GANKA KIYO (J JPN OPHTHALMOL)
NIPPON HOIGAKU ZASSHI (JPN J LEG MED)
NIPPON IJI SHINPO (JPN MED J)
NIPPON IKA DAIGAKU ZASSHI (J NIPPON MED SCH)
NIPPON KAGAKU RYOHOGAKUKAI ZASSHI (CHEMOTHERAPY (TOKYO
NIPPON KOSHU EISEI ZASSHI (JPN J PUBLIC HEALTH)
NIPPON NAIBUMPI GAKKAI ZASSHI (JPN J ENDOCRINOL)
NIPPON NAIKA GAKKAI ZASSHI (J JPN SOC INTERN MED)
NIPPON NOGEI KAGAKU KAISHI (J AGRIC CHEM SOC JPN)
NIPPON NOSON IGAKKAI ZASSHI (J JPN ASSOC RURAL MED)
NIPPON OYO DOBUTSU KONCHU GAKKAI=SHI
(JPN J APPL ENTOMOL ZOOL)
NIPPON RINSHO (JPN CLIN MED)
NIPPON SEIRIGAKU ZASSHI (J PHYSIOL SOC JPN)
NIPPON YAKURIGAKU ZASSHI (JPN J PHARMACOL)
NO TO SHINKEI (BRAIN NERVE)
NOGYO GIJUTSU (TOKYO) (J AGRIC SCI (TOKYO))
NOR VET=TIDSSKR
NORD VET MED
NOT MAL PIANTE
NOYAKU KENSASHO HOKOKU SEE BULL AGRIC CHEM INSP STN
NOYAKU SEISAN GIJUTSU (PESTIC TECH)
NUOVI ANN IG MICROBIOL
NUTR REP INT
OCCUP DIS CALIF ATTR PESTIC AGRIC CHEM
OECD AGRIC REV
OECOL PLANT
OHIO AGRIC RES DEV CENT RES CIRC
OIKOS
OKAYAMA IGAKKAI ZASSHI (J OKAYAMA MED SOC)

OKAYAMA-KEN EISEI KENKYUSHO NENPO
(ANNU REP OKAYAMA PREFECT PUBLIC HEALTH LAB)
OLEAGINEUX
ONDERSTEPOORT J VET RES
ORG MASS SPECTROM
ORNITHOL BEOB
ORV METIL
OUTLOOK AGRIC
OYO-YAKURI (PHARMACOMETRICS)
PACIFIC SCI
PAEDIATRICIAN
PAK J SCI IND RES
PAMIET PULAWSKI
PAN AM HEALTH ORGAN SCI PUB
PAP PUU
PAPUA NEW GUINEA AGRIC J
PATHOL BIOL
PATOL FIZIOL EKSP TER
PATOL POL
PEDIATR POL
PEDIATRICS
PEDIATRIYA (MOSCOW)
PEDOBIOLOGIA
PEDOLOGIE
PEST CONTROL
PESTIC BIOCHEM PHYSIOL
PESTIC MONIT J
PESTIC SCI
PESTIC TECH SEE NOYAKU SEISAN GIJUTSU
PESTICIDES
PESTICIDES (TOKYO) SEE NOYAKU
PFLANZENARZT
PFLANZENSCHUTZ-NACHR (AM ED)
PHARM GAZ SEE YAKUHU KOHO
PHARM PRAX
PHARM UNSERER ZEIT
PHARMACOL BIOCHEM BEHAV
PHARMACOL RES COMMUN
PHARMACOLOGIST
PHARMACOLOGY
PHARMACOMETRICS SEE OYO YAKURI
PHARMACY SEE FARMUASHIA
PHARMAZIE
PHYCOLOGIA
PHYSIOL PLANT
PHYSIOLOGIST
PHYTIATR-PHYTOPHARM
PHYTOCHEMISTRY
PHYTOMA
PLANT PROTECT SEE SHOKUBUTSU BOEKI
PLANT SOIL
PLANTA MED
POCHVOVED AGROKHIM
POCHVOVIDENIE
POL ARCH HYDROBIOL
POL ARCH WETER
POL TYG LEK
POSTEPY MIKROBIOL
POSTEPY NAUK ROLN
POSTGRAD MED J
POTATO RES
POULT SCI
POUMON COEUR
POZNAN TOW PRZYJ NAUK PR KOM
PR NAUK INST OCHR ROSL
PRAC LEK
PRACTITIONER
PRAKT TIERARZT
PRAXIS
PROBL ANAL KHIM
PROBL ENDOKRINOL
PROC AM ASSOC CANCER RES
PROC ANNU CALIF WEED CONF
PROC ANNU CONF SOUTHEAST ASSOC GAME FISH COMM
PROC ANNU MEET N J MOSQ EXTERM ASSOC
PROC ARKANSAS ACAD SCI
PROC AUST BIOCHEM SOC
PROC CAN FED BIOL SOC
PROC CONF POLLUT NAVAL WATER PEARL HARBOR
PROC ENTOMOL SOC ONT
PROC INDIANA ACAD SCI
PROC INT CONF ADV WATER POLLUT
PROC INT SYMP RADIOECOL APPL PROT MAN HIS ENVIRON
PROC IOWA ACAD SCI
PROC KANSAI PLANT PROTECT SOC
SEE KANSAI BYOCHUGAI KENKUKAI-HO
PROC KANTO TOSAN PLANT PROTECT SOC
SEE KANTO TOSAN BYOGAICHU KENKYUKAI NENPO
PROC MEAT IND RES CONF
PROC N DAK ACAD SCI
PROC N Z WEED PEST CONTROL CONF
PROC NATL ACAD SCI INDIA
PROC NATL ACAD SCI USA
PROC NORTHEAST WEED SCI SOC
PROC PA ACAD SCI
PROC R SOC LONDON
PROC R SOC MED
PROC S D ACAD SCI
PROC S WEED SCI SOC
PROC SOC ANAL CHEM
PROC SOC EXP BIOL MED
PROC SOC PLANT PROTECT HOKURIKU
PROC TRANS RHODESIA SCI ASSOC
PROC WEST PHARMACOL SOC
PROC WEST SOC WEED SCI
PROGR AGRIC ARIZONA
PROGR CHEM CHEM IND SEE HWAHAK KWA KONGOP UI CHINBO
PROGR MED SEE IGAKU NO AYUMI
PROMPT REP STUD TOKYO METROP AGRIC EXP STN
PROTOPLASMA
PRUM POTRAVIN
PSZCZELNICZE ZESZ NAUK
PUBLIC HEALTH
PUBLIC HEALTH INFORM SEE KOSHU EISEI JOHO
PYRETHRUM POST
QUAD SCLAVO DIAGN CLIN LAB
QUAL PLANT PLANT FOODS HUM NUTR
R SOC HEALTH J
RADIOCHEM RADIOANAL LETT
RASS CHIM
RAST ZASHT
REC MED VET ECOLE ALFORT
RECHERCHE
RECL MED VET
REFUAH VET
REP EHIME PREFECT HYG LAB
SEE EHIME-KENRITSU EISEI KENKYUSHO-HO
REP HOKKAIDO INST PUBLIC HEALTH
SEE HOKKAIDORITSU EISEI KENKYU SHOHO
REP TOKYO PUBLIC HEALTH STUD
SEE TOKYO-TO EISEI-KYOKU GAKKAI-SHI
RES COMMUN CHEM PATHOL PHARMACOL
RES EXP MED
RES IND
RES LIFE SCI
RES VET SCI
RESIDUE REV
RESUSCITATION
REV ACAD CIENCIAS
REV AGROQUIM TECNOL ALIMENT
REV INST ADOLFO LUTZ
REV MED-CHIR
REV MED VET (TOULOUSE)
REV ROUM BIOCHIM
REV ROUM EMBRYOL
REV ROUM NEUROL
REV SANID MIG PUBLICA
REV VET VENEZ
RHOD J AGRIC RES
RHOD SCI NEWS
R I MED J
RICE J
RINGYO TO YAKUZAI (FOR PHARM)
RINSHO GANKA (JAP J CLIN OPHTHALMOL)
RINSHO NOHA (CLIN ELECTROENCEPHALOGR)
RINSHO SHINKEIGAKU (CLIN NEUROL)
ROCKY MT MED J
ROCZN PANSTW ZAKL HIG
ROCZN POMOR AKAD MED SZCZECINIE
RODO EISEI (JPN J IND HYG)
RYBN KHOZ (MOSCOW)
S AFR J LAB CLIN MED
S AFR MED J
S DAK BIRD NOTES

SAKH PROMST
SANGYO IGAKU (IND MED)
SANKYO KENKYUSHO NENPO (ANNU REP SANKYO RES LAB)
SCAND J RESPIR DIS
SCHWEIZ ARCH TIERHEILKD
SCHWEIZ Z FORSTWES
SCI AGRIC BOHEMOSLOV
SCI AM
SCI FOODS SEE SHOKURYO NO KAGAKU
SCI NEWS
SCI PEST CONTROL SEE BOCHU KAGAKU
SCI TOOLS
SCI TOTAL ENVIRON
SCIENCE
SCIENCE (TOKYO) SEE KAGAKU (TOKYO)
SCIENCES
SCR MED FAC MED UNIV BRUN PURKYNIANAE
SEA SECRETS
SEARCH
SEIKAGAKU (J JPN BIOCHEM SOC)
SEIKATSU EISEI (J URBAN LIVING HEALTH ASSOC)
SELSKOSTOP NAUKA
SEM HOP
SENRYO TO YAKUHIN (DYEST CHEM)
SENTEN IJO (CONGENITAL ANOMALIES)
SHOKUBUTSU BOEKI (PLANT PROTECT)
SHOKUBUTSU NO KAGAKU CHOSETSU (CHEM REGUL PLANTS)
SHOKUHIN EISEIGAKU ZASSHI (J FOOD HYG SOC JPN)
SHOKURYO NO KAGAKU (SCI FOODS)
SHONIKA SHINRYO (J PEDIATR PRACT)
SOAP COSMET CHEM SPEC
SOGO RINSHO (CLIN ALL-AROUND)
SOIL BIOCHEM
SOIL BIOL BIOCHEM
SOIL CROP SCI SOC FLA
SOIL SCI
SOIL SCI PLANT NUTR (TOKYO)
SOIL SCI SOC AM PROC
SOOBSHCH AKAD NAUK GRUZ SSR
SOUTHWEST VET
SOV GENET (TRANS OF GENETIKA)
SOV MED
SOV SOIL SCI
SOV ZDRAVOOKHR KIRG
STOMATOLOGIYA (MOSCOW)
STRAHLENTHERAPIE
STUD CERCET BIOL SER ZOOL
STUD CERCET CHIM
SUD-MED EKSPERT
SUESSHAREN
SULZER TECH REV
SYMP BIOL HUNG
T'AI-WAN I HSUEH HUI TSA CHIH
SEE J FORMOSAN MED ASSOC
TAIWANIA
TALANTA
TECH SCI MUNIC
TECHNOL REV
TERATOLOGY
TETHYS
TETRAHEDRON
TETRAHEDRON LETT
TEX J SCI
THER GGW
THERAPIE
THORAX
TIDSSKR NOR LAEGEFOREN
TIDSSKR PLANTEAVL
TIERAERZTL UMSCH
TIJDSCHR DIERGENEESKD
TIJDSCHR SOC GENEESKD
TNO NIEUWS
TOB HEALTH WORKSHOP CONF PROC
TOB INT SEE TOB SCI
TOB SCI
TOHO IGAKKAI ZASSHI (J MED SOC TOHO UNIV)
TOHOKU J EXP MED
TOKYO-TO EISEI-KYOKU GAKKAI-SHI
(REP TOKYO PUBLIC HEALTH STUD)
TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
(ANNU REP TOKYO METROP RES LAB PUBLIC HEALTH)
TOXICOL APPL PHARMACOL
TOXICOLOGY
TR VSES INST VET SANIT
TR VSES NAUCH-ISSLED INST VET
TRANS AM FISH SOC
TRANS ASAE (AM SOC AGRIC ENG)
TRANS ILL STATE ACAD SCI REP
TRANS R SOC TROP MED HYG
TRANS SOC PATHOL JPN
SEE NIPPON BYORI GAKKAI KAISHI
TRANS ST JOHN'S HOSP DERM SOC
TRAV SOC PHARM MONTPELLIER
TRIANGLE
TRIB CEBEDEAU
TROP MED
TSITOL GENET
TSITOLOGIYA
UGESKR LAEG
UKR BIOKHIM ZH
UKR KHIM ZH
ULSTER MED J
UMWELT
UZB KHIM ZH
VA POLYTECH INST WATER RESOUR R
VAR FOEDA
VERH DTSCH GES INN MED
VESTN AKAD MED NAUK SSSR
VESTN DERMATOL VENEROL
VESTN OFTALMOL
VESTN OTORINOLARINGOL
VESTN SIKH NAUKI (MOSCOW)
VESTSI AKAD NAVUK BSSR SER SEL'SKAGASPAD NAVUK
VET GLAS
VET ITAL
VET MED
VET-MED NAUKI
VET MED SMALL ANIM CLIN
VET REC
VETERINARIYA (MOSCOW)
VIRCHOWS ARCH A
VISSH SELSKOSTOP INST V KOLAROV
VOD HOSPOD B
VOEDINGSMIDDELENTECHNOLOGIE
VOENNO-MED ZH
VOJNOSANIT PREGL
VOM WASSER
VOPR MED KHIM
VOPR ONKOL
VOPR PITAN
VRACH DELO
WAKAYAMA-KEN EISEI KENKYUSHO NENPO
(ANNU REP WAKAYAMA PREFECT INST PUBLIC HEALTH)
WASSERWIRTSCH-WASSERTECH
WATER AIR SOIL POLLUT
WATER RES
WATER RESOUR BULL
WATER RESOUR RES
WATER SEWAGE WORKS
WATER WASTE SEE YOSUI TO HAISUI
WEED CONTROL SEE ZASSO TO SONO BOJO
WEED RES
WEED RES (TOKYO) SEE ZASSO KENKYU
WEED SCI
WEST INDIAN MED J
WHO CHRONICLE
WHO TECH REP SER
WIAD LEK
WIAD PARAZYTOL
WIEN KLIN WOCHENSCHR
WIEN MED WOCHENSCHR
WIEN TIERAERZTL MONATSSCHR
WISS Z TECH UNIV DRESDEN
WORLD FARMING
WORLD HEALTH ORGAN TECH REP SER
WORLD REV NUTR DIET
XENOBIOTICA
YAKUGAKU ZASSHI (J PHARM SOC JPN)
YAKUMU KOHO (PHARM GAZ)
YAMAGUCHI-KEN EISEI KENKYUSHO KENPO
(ANNU REP YAMAGUCHI PREFECT RES INST HEALTH)
YAMAGUCHI SANGYO IGAKU (ANNU REP YAMAGUCHI SOC IND HE
YAMANASHI KENRITSU EISEI KENKYUSHO NENPO
(ANNU REP YAMANASHI PREFECT INST PUBLIC HEALTH)

76-0001. Anonymous. **What will the new pesticide regulations mean to you?** *Am. Fruit Grow.* 95(2): 15-16; 1975.

The new restrictions placed on pesticide manufacture and use by the EPA will affect an estimated 15,000 products used on fruits, vegetables, and ornamentals. The crop liability may be so large in proportion to the amount of pesticide used on the crop that registrations will be dropped. Some help in registering pesticides for needed uses is being provided by the IR-4 project and Technical Committee, financed by USDA. However, the cost is still just as great to register for a minor as for a major use, and therefore the minor uses are being dropped. Growers who are aware of a minor use that needs registration are urged to be certain their extension service is aware of it. All 33,000 pesticide registrations which are currently in existence will come up for systematic review every 5 years under the new rulings. In the past, only effectiveness and short-range toxicity were evaluated. Now the long-range toxicity for these compounds must be evaluated to meet the new standards. The banning of a compound due to any evidence of oncogenicity has created the problem for aldrin/dieldrin. In the EPA ruling, oncogenicity is defined as "the property of a substance or a mixture of substances to produce or incite tumor formulations in living tissue". This phrase threatens the registration of any chemical which causes tumors when fed to a test animal (usually a mouse) at any dose level, in spite of extensive evidence which shows that the mouse liver is so susceptible that it responds with an excess of tumors to changes in oxygen in the air it breathes, to increased food, or to the addition of common protein to its diet. "Unreasonable adverse effects" to the environment are also grounds to deny registration to a pesticide. It is expected that most of the pesticides used in agriculture will appear on the restricted use list. Users of restricted pesticides will have to be commercial or private licensed applicators.

76-0002. Whitten, M. J.; Foster, G. G. (Div. Entomol., CSIRO, Canberra, 2601 Australia). **Genetical methods of pest control.** *Annu. Rev. Entomol.* 20: 461-476; 1975. (80 references)

Consideration has been given to the thought of deliberately manipulating the level of genetic death in natural populations with a view to reducing the abundance of pests. The current status of the sterile insect release method is reviewed with special emphasis on the Southwestern screwworm eradication program, the sterile codling moth release project in British Columbia, and efforts against the boll weevil. One of the greatest problems faced by entomologists in genetic control programs has been that of rearing, sterilizing, and distributing economically large numbers of insects which are competitive under field conditions. Significant advances have been made in the mass-rearing and handling procedures for many of the important pests. It is cautioned that one must watch for undesirable genetic changes occurring during mass rearing and also eliminate the risk of colonizing unsuitable genetic material. A major operational deficiency inherent in current programs of this nature is the need to rear, sterilize, and release both sexes. Without extensive formal genetics, it should be possible to link insecticide resistance to sex chromosomes in a large number of species in such a way that discriminating doses of insecticide applied during immature stages would kill all members of one or the other sex. In addition to induced sterility of insects, there are also cases of sterility which were non-induced. Under the heading of non-induced sterility, inherited sterility, genetic tricks which may allow the exploitation of certain naturally occurring forms of sterility, and various modifications of and departures from induced sterility programs are discussed.

76-0003. Anonymous. **Is EPA stifling development of new pesticides?** *Chem. Week* 117(18): 25-26; 1975.

It is charged that the program of the EPA is not generating the new pesticides needed to replace banned materials. The banning of DDT, aldrin, and dieldrin and the suspension of heptachlor and chlordane take away vital tools needed to combat forest and crop devastation and maintain public health. Research in this area seems to be grinding down to a slow pace. It is stated that before EPA regulations, some 700 new pesticides were being developed each year in the U.S. The current figure is 20-30/year. This endangers the future of some crops. In some cases no pesticides have been developed to replace those no longer allowed in use, because the quantities needed are not sufficiently large to cover the increased cost of research and development. Smaller and more recently formed companies simply cannot stand the financial strain caused by the newer regulations. Although substitutes for the banned chemicals seem to be doing a successful job at the present time, the question of how to meet insect resistance to some pesticides which is bound to develop is not answerable at present. Many people in the field have declared that inconclusive studies and distorted data account for much of the evidence that has led to pesticide bans. The problem of mounting public fear of pesticide residues is briefly mentioned.

76-0004. Boerma, A. H. (Director General FAO, Rome, Italy). **World food.** *Farm Chem.* 138(9): 16-19; 1975.

At a time when the world needs all the food it can produce, more than one third of the potential world harvest each year is destroyed by pests, plant diseases, and weeds. A further 15% of a country's food production is often lost after harvest due to pests which attack in storage. While pesticides have usually been produced in enough supply to meed the demand, the stortages encountered in many areas in 1974 also occurred in the area of pesticides. The general economic picture has resulted in a reduced demand for raw materials. The current depression in the textile industry has reduced the demand for cotton, which used to account for half the world's insecticide consumption. Changes in agricultural emphasis will result in the use of some of the fields which had been used for cotton to grow maize, sorghum, and soybeans. The introduction of systemic materials has caused a huge expansion in fungicide usage. It is expected that by 1985 the demand

for pesticides by developing countries will have increased 5-fold compared with the beginning of this decade if food production is to accelerate to the level required to feed the population. The cost of developing new and more selective pesticides continues to increase. Environmental pressures, shortages of required materials for building new research centers, and other problems have slowed research in this area. It is noted that, if pesticides are to be used well in the developing countries, extensive instruction in their use must be made available for the people there. The tremendous problems of communication and education must be met.

76-0005. Anonymous. **Pesticides: key to a better environment.** *Farm Chem.* 138(9): 22,24,26; 1975.

FAO's chief of Plant Protection Service, William Furtick, indicated that the FAO global program utilizes small committees, working parties, and panels of experts to assess international needs and programs in various aspects of plant protection and to develop global standards and activities relating to the use of pesticides. FAO programs are not designed to contact farmers directly, although they do have an indirect impact on farmers. European pesticide industries have greatly assisted FAO demonstration programs, and it is hoped that more American companies will become similarly involved. In the next 5 yr, crop protection chemicals will be needed most in the developing countries to prevent the collapse of food production targets in relation to increasing need. Increasing costs and stringent government standards have slowed the development of commercial pesticides for restricted markets. A new study of patent law is urgently needed, as are new pesticides to replace those becoming obsolete because of pest resistance. Because many developing countries have a keen interest in manufacturing some of the less expensive older pesticides, such as DDT and aldrin, programs are in operation to increase the potential of local supply for interested countries and to avoid some of the unnecessary consequences encountered with these types of materials. Proper use of pesticides can be a major factor in the achievement of a better environment.

76-0006. Wittwer, S. H. (Coll. Agric. Natural Resources, Michigan State Univ., East Lansing MI). **Agriculture needs a "Manhattan Project".** *Farm Chem.* 138(9): 27,30-31; 1975.

Although billions of U.S. dollars are spent annually on energy research and the enforcement of social, political, environmental, and economic constraints, only a few million are directed toward more efficient renewable resource productivity. The interdependence of energy and food and the renewability or lack of renewability of resources with the associated costs will greatly modify future agricultural research strategies. About 3% of the nation's total energy budget is spent on food production, which nonetheless still gives a positive energy return. Energy inputs into food processing, packaging, storage, transportation, and preparation exceed by several-fold that of actual on-farm production, and there should be a major agricultural effort to assess these inputs for each commodity. Agricultural research priorities should include enhancement of productivity, improvement or maintenance of nutritional quality, environmental improvement, weather modification, assessment of the rapidly increasing acid precipitation, and more efficient transportation of agricultural products. Other crucial targets for future research include biological nitrogen fixation, photosynthesis, pest management, and improved crop and livestock protection. A massive "Manhattan Project" in U.S. agricultural research is proposed to achieve a victory over famine.

76-0007. Anonymous. **World pesticide markets.** *Farm Chem.* 138(9): 45-48; 1975.

Leading international marketers of pesticides forecast that the world market for agricultural chemicals will reach $7.4 billion at the user's level by 1980, and that figure does not include pesticides sold for industrial and lawn and garden use. This figure was derived from the results of a confidential survey of companies operating on the international pesticide market. According to the predictions, the market for herbicides will be $3422 billion by 1980, and those for insecticides, fungicides, soil fumigants, growth reglators, and defoliants and desiccants will be $2413 million, $1382 million, $100 million, $118 million, and $31 million, respectively. It is felt that the U.S. will be the largest market for pesticides at that time, but use in most of the developing areas of the world is expected to show substantial increases. The figures reflect no effort to project growth due to inflation, and no predictions can be made regarding actions which may be taken to restrict the use of pesticides or production of new compounds.

76-0008. Anonymous. **Herbicides pack protein surprise.** *Farm Chem.* 138(9): 130-131; 1975.

Recent findings indicate that certain herbicides not only control weeds on rangeland, they also increase the protein content of range grasses and protect plants from drought. The beneficial herbicides include atrazine, simazine, and cyanazine. These compounds have been shown to increase the nitrate-nitrogen content of herbage by as much as 29%, and in some cases have increased the dry matter yields of rangeland. Greenhouse studies indicated that atrazine decreased root growth of blue grama grass seedlings while increasing nitrogen and phosphorus uptake/unit weight of root 3-7-fold. The beneficial effects of the herbicides are increased additively by the application of nitrogen fertilizers. In 1971 and 1972, atrazine protected blue grama grass from a disastrous combination of drought and nitrogen fertilizer, preventing expected losses in yield of up to 95%. Atrazine reduces transpiration and helps plants to more efficient use of the available moisture. The only disadvantage of these triazines is that they decreased the yields of two valuable cool-season grasses, western wheat-grass and needle-and-thread. Due to the cost of the herbicides, however, nitrogen fertilizers still appear to be the most profitable means of increasing protein yields on shortgrass range in the Central Plains.

76-0009. Anonymous. **Scientific judgment must prevail.** *Farm Chem.* 138(9): 50,52; 1975.

Using its proposal to suspend all but two uses of chlordane and heptachlor insecticides as a vehicle, the U.S. EPA is attempting to firmly establish its nine principles of carcinogenicity as the basis for evaluating the safety of all chemicals. If these principles are accepted and go unchallenged by the courts, the future of all chemicals is questionable; most synthetic products and many natural products could conceivably be declared carcinogens. Although these principles have been challenged by most of the scientific community, EPA has fought industry attempts to have them evaluated by the National Academy of Science. Thus, industry as well as the agricultural community are strongly supporting a proposed amendment to the Federal Environmental Pesticide Control Act (FEPCA); the Poage-Wampler Amendment would require approval of the Agricultural Secretary before EPA could cancel or reclassify pesticide registrations.

76-0010. Hori, M. A. (Author address not given). **Evaluating agricultural chemicals.** *Farm Chem.* 138(9): 60-62; 1975.

The Japan Plant Protection Association (JPPA) and the Institute of Environmental Toxicology (IET) each play an important role in the evaluation of agricultural chemicals in Japan. The JPPA promotes and disseminates plant protection information through its own research, educational and training meetings, publications, and other activities. Regular members include those specializing in various plant protection sciences, supporting members include manufacturers and formulators of agricultural chemicals and equipment, and special members are the plant protection societies founded to cover prefectural areas. JPPA screens new compounds and evaluates their animal toxicity; it also assigns the testing of plant protection materials and equipment to research institutes and experimental stations when requested by the companies involved. It cooperates with government authorities in fostering government administrative activity. The IET is a public institution under the supervision of the Ministry of Agriculture and Forestry and the Ministry of Health and Welfare. It conducts research on the toxicity, metabolism, and residual persistence of chemical substances in accordance with requests from manufacturers. Toxicity is studied with respect to mutagenicity, teratogenicity, carcinogenicity, acute/subacute toxicity, and chronic toxicity.

76-0011. Berg, G. L. (Author address not given). **"Poage-Wampler"—our one big hope!** *Farm Chem.* 138(9): 136; 1975.

No one, including the EPA, knows what really causes cancer in humans, although millions of dollars are being spent to find the answers and many theories are in existence. However, EPA claims to know what causes cancer—chemicals, particularly pesticides. EPA Administrator Russell Train's nine principles of carcinogenicity center around the idea that any which increases tumor incidence in man or animals is a carcinogen. The concept of a "threshold" exposure level for a carcinogenic agent is claimed to have no practical significance, and even the induction of benign tumors is felt to be sufficient to characterize a chemical as a carcinogen. The Poage-Wampler Amendment to the Federal Environmental Pesticide Control Act is supported.

76-0012. Anonymous. **DDT residues decline.** *FDA Consum.* 9(5): 23; 1975.

A decline in DDT-related pesticides in the Nation's food supply has come about since the drastic curtailment of the use of DDT on crops and elsewhere. All food products showed this decline with the exception of eggs, where the DDT content remained the same, and milk, in which the DDT content was slightly higher than it had been previously. The DDT in the milk was in the form of DDE. A survey has also been made of the residues of PCBs in 10 major food categories. A study made in 1973 showed evidence of violative residues involving 8,388 samples of which 3,013 were imports. For chlorinated pesticides, the samples showed overall violative residues on or in 2.1% of domestic products and, for organophosphorus pesticides, 1.1% of domestic products and 3.5% of imported products. During the study somewhat limited use was made of a new laboratory detection method which is capable of detecting up to 60 different organophosphorus compounds or breakdown products. More extensive use of this method is planned for the future. The relative frequency of dieldrin residue occurrence declined slightly in raw agricultural products, but increased slightly in dairy products, eggs, and fish. PCB residues were not found frequently, except among fish. Organophosphorus pesticide residue occurrence was not significant in dairy products, eggs, and fish, but a slight shift toward more residues in raw agricultural products appeared, due perhaps to the shift away from organochlorine pesticides. Combined endosulfan compounds, toxaphene, and carbaryl appeared in larger amounts in relative frequency. BHC occurred in increased amounts in milk, dairy products, and fish, and remains the most frequently encountered residue in European cheese.

76-0013. Mauro, A. **PCB (Policlorobifenili) ed Ambiente. [PCBs and the environment.]** *Ind. Aliment. (Pinerolo, Italy)* 13(11): 97-100; 1974. (4 references) (Italian)

The spread of PCBs in the environment and their effects on the ecosystem are examined. PCBs are chemically inert synthetic products. They are chloride derivatives of diphenyl, and, depending on the production process, will contain varying percentages of chlorine. They are resistant to heat, alkalies, acids, and chemical agents in general, and are practically insoluble in water. Their widespread industrial use is due to their chemical stability. DDT and PCB percentages were determined in various materials; in most cases, the percentage of PCBs was higher. This indicates that DDT is disappearing from the

environment since its use has been banned, and that PCBs are the most prevalent organchlorines in the environment. Because of their resistance to heat, PCBs can remain in emissions from incinerators burning solid wastes. During combustion, oxidized products of PCBs can form; their acute toxicity may be much higher than that of the initial compound. Of these highly toxic impurities, polychloro -dibenzofurans are found most frequently in commercial PCBs. Their presence complicates the study of the toxicity of PCBs per se. The toxicity of PCBs is largely due to their chlorine content; in particular, those with a lower chlorine content will affect animal reproduction while those with a higher content will affect the liver in the long run. Genetic effects on the offspring of mammals and birds after chronic intoxication by PCBs have been studied. Rats and rabbits were fed diets with different concentrations of PCBs; the rats gave birth to smaller litters, and toxic effects were detected in rabbit embryos. Hens fed diets contaminated with PCBs laid fewer eggs. Similar results were found for man. In Japan, 300 individuals who had ingested rice oil containing 200 ppm of PCBs demonstrated cutaneous symptoms, fatigue, edema, and fits of vomiting; observations on the children born of contaminated mothers revealed that of 13 pregnancies two terminated in stillbirths; ten of the liveborn infants had brownish-grey skins, and 9 demonstrated excessive lacrimation. Most of them were undersized.

75-0014. Casey, J. E.; Lacewell, R. D.; Sterling, W.* (Dep. Agric. Econ., Texas A&M Univ., College Station, TX 77840). **An example of economically feasible opportunities for reducing pesticide use in commercial agriculture.** *J. Environ. Qual.* 4(1): 60-64; 1975. (4 references)

Due to increasing resistance of the bollworm, *Heliothis zea* (Boddie), and tobacco budworm, *Heliothis virescens* (F.), in 1968 and 1969, the Texas Department of Corrections in cooperation with the Texas Agricultural Experiment Station initiated a new pest management strategy. This new strategy was basically (i) to control boll weevil with a fall diapause program (ii) control fleahopper with low dosages of insecticides applied as early as feasible and (iii) to terminate fleahopper, *Pseudatomoscelis seriatus* (Reuter), treatments quickly to allow beneficial insects to build and control bollworm and budworm. Comparing 1968-69 cotton, *Gossypium herbaceum* L., production (traditional insecticide treatment) to the new 1970-72 strategy indicates that insecticide use declined from 14.51 kg/ha to 7.19 (12.9 to 6.4 lb/acre) while lint yield increased due to the new pest management of Corrections cotton farms. Estimated net returns would be expected to increase $55.87 ($22.61 on a per acre basis) with adoption of the new pest management strategy compared to the traditional strategy. The Trinity River region of the Texas Department of Corrections cotton farms indicate that the new pest management strategy brought about a 50% reduction in per hectare quantity of insecticides used (from 12.28 to 6.22 kg [10.8 to 5.6 lb]), a 90 kg/ha (80 lb/acre) yield increase, and $85.50/ha ($34.62/acre) net return increase. Expanding these results to the 86.8 thousand hectares (215 thousand acres) of cotton in the surrounding area indicates that the new pest managment strategy would increase cotton output by over 27.4 thousand bales, reduce quantity of insecticides applied by 607,000 kg (1.4 million lb) while increasing producer net returns over 5 million dollars. (Author abstract by permission)

76-0015. Hisayama, H.; Noboru, S. (Tokyo Yukikagaku Industrial Co. Ltd., Tokyo, Japan). [**Recent trends in the pesticide industry.**] *Kagaku To Kogyo (Tokyo) (Chem. Chem. Ind.)* 28(8): 588-591; 1975. (Japanese)

Recent trends of pesticide use in Japan are reviewed. With increasing world population, high yield crop production is necessary using more effective pesticides. These pesticides must be safe. The development of new pesticides is very costly because of the basic research needed, prior to production, to prove the safety of the pesticide and to investigate its biological and environmental effects. Therefore unless the pesticide is likely to sell in large quantities (for example on the international market), development of new pesticides cannot be expected. The production of mixed pesticides, with components of proven safety, is increasing rather than new development; utilization of synergistic effects of combined pesticides is the common practice. Examples of such mixed pesticides are given. Japan's pesticide production ranks second in the world; pesticides produced in 1974 were worth 633 million dollars. The bulk of pesticide production capacity in Japan is occupied by 200 different kinds of insecticides and herbicides. Most of these pesticides are not sold on the international market except a few such as Sumithion (fenitrothion) and Topsin M (thiophanate-methyl).

76-0016. Collins, P. (Author address not given). **A new way to slay old pests.** *Nature* 257(5521): 2-3; 1975.

In recent years, interest in the potential of virus control of insect pests has increased due to the growing seriousness of the world food situation and concern over the cost and environmental and resistance problems associated with chemical pesticide use. Because of the risk of cross-infection with higher animals, only the baculoviruses of the seven groups of viruses known to occur in insects should be considered as pesticidal agents. Work in the United Kingdom is at present concentrated on the nuclear polyhedrosis viruses (NPVs) which attack four members of the Lepidopteran genus *Spodoptera*, including *S. exempta*, which is possibly the world's most serious grassland pest. Studies are concerned with the chemical, physical, and biological properties of the insect viruses, their effects on insect hosts, and the manner in which the viruses spread under natural conditions. This involves isolation and characterization of the virus, laboratory testing, and field testing on both target and nontarget species. Viral pesticides have been on the U.S. market for some time and have been used extensively in the USSR for a number of years. Nonetheless, rapid and sensationally successful control of target pests using viral pesticides will require a great deal more rigorous testing as well as the development of standardized formulations that can be used on a large scale in complete safety.

76-0017. Anonymous. **US DDT ban has been beneficial.** *New Sci.* 67(967): 659; 1975.

Since DDT was banned in the United States in 1972, there has been a marked decline in the level of DDT residues in human tissues, foodstuffs, and the environment. The human dietary intake of the insecticide has declined from 13.8 mg/day in 1970 to 1.88 mg/day in 1973. Although most uses of DDT were banned by EPA in 1972, the ban has been administered flexibly; thus the use of DDT has been permitted in certain cases, e.g., to safeguard timber in the northwestern US from tussock moths in 1974. Switching to alternative pesticides has cost cotton farmers, previously the biggest users of DDT, just over $1.00/acre/yr, while the increased cost of cotton goods to the consumer has been just over 2 cent/yr. The economic impacts have been well within the range of those predicted in 1972.

76-0018. Shotwell, T. K. (Dallas, TX). **Patterns in federal regulation of pesticides.** *Pest Contr.* 43(1): 16,18-19,22; 1975.

Complicated and confusing conditions between the federal government and many chemical firms has led to the presentation of fewer new pesticides each year. In the light of recent changes and demands for changes, new understandings have been gained about non-reversible toxic effects such as teratogenic, mutagenic, carcinogenic, and tumorigenic effects. Subtle, delayed, irreversible, and sometimes lethal effects from new chemicals over long periods of time have forced the old view of 90-day toxicity tests to change. Costs for new product research are astronomical. The law requiring all pesticides to be reregistered and classified as to their use pattern on the basis of human and environmental hazards has caused the number of applications for registration to rise steadily over the past 4 yr. Changes have come about in the very methods used by corporations in reaching decisions and answering questions concerning new product development. Except in the largest of firms, outside support of inhouse efforts is a prerequisite to economical and timely government approvals. While consumer awareness has increased, consumer knowledge has not kept pace and political interests are of magnified significance.

76-0019. Truhaut, R. (Fac. Sci. Pharm. Biol., Univ. Rene Descartes, Paris V, France). **Can permissible levels of carcinogenic compounds in the environment be established?** *Proc. Int. Cancer Congr., 11th* 3: 50-57; 1974. (13 references)

There is a current view concerning exposure to carcinogens, including pesticide residues, that it is impossible to establish safe limits of exposure to these chemicals because there are no thresholds for their action. In support of the no-threshold theory the following arguments are advanced: the self replicating nature of the cancer cell, the origin of which may be the result of a change in only one molecule of DNA; the results of quantitative studies in lab animals which indicate that the primary carcinogenic effects of all individual doses, even the smallest, persist and remain irreversible often over the whole life span of the animal; evidence from experiments indicating lasting change induced by one tumor-initiating event; the fact that cancer can occur in response to chemicals even after single doses, long after the chemical disappears from the body; and the possibility that cancer may result from mutation in a somatic cell. Arguments against the theory of no thresholds for carcinogens include: the thought that there is indeed a threshold for each individual; cellular mechanisms for the repair of DNA; the probability of cancer induction from single exposure; immunological surveillance mechanisms present in the host; the dose-effect relation of cigarette smoking and human cancer; and specific experimental findings in favor of the existence of thresholds for carcinogens. Some consideration is given to the practical problems.

76-0020. Anonymous. **New pesticides face EPA delay.** *Rice J.* 78(1): 21; 1975.

A panel discussion at a meeting of the State Agricultural Pesticide Association in Arkansas concluded that the farmers would probably have to learn to get along with the pesticides they were now using as it appeared that obtaining new ones would be a difficult accomplishment. This feeling results from the new regulations placed on the use of pesticides, particularly the development of new materials. The increased costs necessary to meet the new requirements will add a long lag time in the production of new chemicals. It is viewed as ironic that these new regulations appear at the very time when the need for increasing production of foodstuffs is so vital to the world.

76-0021. Baldacci, E.; Conti, G. G. (Catt. Patol. Veg., Fac. Agric., Milan, Italy). **Veleni ed ecologia agraria. [Poisons and agricultural ecology.]** *Riv. Clin. Tossicol.* 3(1-2): 17-52; 1973. (47 references) (Italian)

Extraneous substances introduced into the agrarian environment as a result of agricultural practices essentially comprise pesticides, fertilizers, and salt deposits due to irrigation. Increases in the number and consumption of pesticides since the 1950's have focused publicity on the dispersal of foreign compounds by agriculture. However, the number of pesticides which are dangerous and persistent is small. The insecticides, often incriminated as widespread contaminants, are being replaced by less persistent compounds. Much of the excessive use of DDT which has resulted in persistent residues stemmed from vector control and public health applications rather than agricultural use. To provide perspectives on the various compounds and their uses, tabular summaries are presented on numbers of active ingredients used in various classes of pesticides; acute toxicities of organochlorine pesticides; acute toxicities of organophosphate insecticides; acute toxicities of other common insecticides; acute toxicities of herbicides; persistence of herbicides in soil; and acute toxicities of fungicides.

76-0022. Kunstadter, P. (East-West Population Inst., Honolulu, HI 96822). **Herbicide use in Vietnam.** *Science* 186(4169): 1075; 1974. (1 reference)

A brief review is given of the work of the National Academy of Sciences Committee on the Effects of Herbicides in Vietnam in response to an article and a letter which the author felt distorted the findings. Areas of concern mentioned in this author's reply were: evidence regarding birth defects, persistence of herbicides, human mortality from sprayed chemicals, damage to the inland forest, seeding by bamboo as a result of herbicide spraying, effects on the total ecosystem, and the value of destroyed crops and forest products.

76-0023. Edwards, J. G. (Dep. Biol. Sci., San Jose State Univ., San Jose, 95192). **Vinyl chloride and DDT: environmental effects.** *Science* 189(4198): 174; 1975. (7 references)

A statement that appeared in an earlier article is corrected in a letter-to-the-editor. The article stated that during World War II, DDT had been used to halt a cholera epidemic in Naples. The epidemic was one of typhus, rather than cholera or malaria. The letter also takes exception to the long persistence of DDT in soils as presented in the original article, citing evidence that DDT showed a short half life of only 3 years in orchard soils which had been heavily sprayed with DDT for a period of 17 yr. In the original article reference was made to the accumulation of DDT in food chains which led to the killing of great numbers of birds and fish. This statement is challenged in the letter and references are given for support of the challenge.

76-0024. Nakagawa, M.; Ando, M.; Obata, Y. (Agric. Chem. Res. Lab., Sankyo Co. Ltd., Tokyo, Japan). **Fate of isoxathion (*O,O*-diethyl *O*-(5 -phenyl- 3-isoxazolyl) phosphorothioate) in soils.** *Agric. Biol. Chem. (Tokyo)* 39(9): 1763-1773; 1975. (24 references)

Findings are presented on the persistence and degradation of isoxathion, ^{14}C-labeled at the 5-position of the isoxazole ring, in three soil types under laboratory conditions. Persistence was influenced by soil type and moisture content. The half life at 30 ppmw dose level fluctuated from 15 to 40 days in nonflooded models. Isoxathion in a flooded model disappeared much faster. Biodegradation of isoxathion produced a number of products with a simultaneous release of $^{14}CO_2$. Major products identified were 3-hydroxy -5-phenyl isoxazole, 5-phenyl -4-oxazolin -2-one, benzoylacetamide, and benzoic acid. Minor products, tentatively identified, were oxon derivative of isoxathion, 3-methoxy- 5-phenylisoxazole, 2-methyl -5-phenyl -4-isoxazolin -3-one, 2-acetyl-5-phenyl -4-isoxazoline-3-one, 2,5-diphenylpyrazine, and acetophenone. None of these major products was persistent in soils. The initial metabolite or hydrolyzate of isoxathion, 3-hydroxy -5-phenylisoxazole, was adsorbed to soil to a much greater extent than isoxathion, thus explaining the rapid disappearance of its fungicidal activity in soil.

76-0025. Abdulla, M.; Dencker, I.; Haglund, G.; Norden, A. (Unit for Community Care Sci., S-240 10 Dalby, Sweden). **Organochlorine pesticides in food studied by double portion sampling technique.** *Ambio* 3(6): 239-240; 1975. (7 references)

The content of pesticides in 113 daily food samples of a group of 67-yr-old pensioners in southern Sweden was analyzed by the double portion technique. The double portion is a copy, as exact as possible, of the food and drink consumed for one day. The first series of samples was collected in 1970, including 36 samples from 11 persons. The second series of 77 samples from 26 persons was collected in 1971. In the first series, with only very few exceptions, the residues were the same as or under the detection limit values. DDT and lindane exceeded detection limits in only 5 and 2 cases, resp. Aldrin was not detected and α-BHC contents were the same as or under detection limits. In the second series similar results were found. Only 8 cases occurred in which the total DDT levels were more than 0.03 ppm. Lindane levels in all cases were under 0.01 ppm. Except for one case, aldrin, dieldrin and α-BHC values were less than or around detection limits. From tests on deep-frozen foods samples, it was noted that none of the residue levels found exceeded the limits and most lay close to the detection limit values. In general the results of this study show that the pesticide residues found in Sweden are much less than those found in many parts of the world.

76-0026. Lopez Gonzalez, J. de D.; Gonzalez Gomez, C.; Ruiz de Almodovar Rivera, J. M. (Fac. Sci., Univ. Granada, Spain). **DDT, a contaminating agent of the atmosphere.** *An. Quim.* 71(5): 495-497; 1975. (7 references)

A series of experiments was conducted to clarify the conditions under which the volatility of DDT becomes significant. A planchet containing 4 ml of an aqueous solution of glucose-^{14}C was measured several times at intervals of 10 min. In each case analogous results were obtained. A similar planchet containing an equal amount of DDT-^{14}C in water was also measured at intervals of 10 min. From the values obtained in these measurements it appeared that DDT progressively accumulated on the surface of the water. However, upon withdrawing the planchet from the counter and measuring the background again, it became apparent that the increase in the detected activity of the sample was due not only to the accumulation of DDT on the surface of the liquid, but also to the contamination of the window of the detector and other nearby parts of the measuring system by volatilized DDT. This phenomenon of the passage of DDT from the water-air interface to the atmosphere is apparently very important in the global process of contamination of the air.

76-0027. Singh, N. P.; Bogden, J. D.; Joselow, M. M. (Dept. Preventive Med., New Jersey Med. Sch., Newark, N.J. 07103). **Distribution of thallium and lead in children's blood.** *Arch. Environ. Health* 30(11): 557-558; 1975. (13 references)

This study attempts to define the distribution of whole blood lead and thallium concentrations in a population of inner-city children. Thallium intoxication has resulted among children after ingesting thallium sulfate- containing pesticides. The children examined were between ages 1 and 5 yr. They were predominantly black and Spanish-speaking residents of Newark, N. J. Determinations were made on 320 blood samples collected over a 4-yr period. No child included in the study had evidence of thallium toxicity. The observed range of thallium found in the blood was between 0.0 μg/100 ml and 8.0 μg/100 ml, and the mean concentration was 0.3 μg/100 ml. About 80% of the population tested showed no detectable concentration of thallium. Detection limits were 0.5 μg/100 ml. In most of the subjects with detectable thallium (96.9%), the concentration was between 0.5 and 2.0 μg/100 ml. Only 1.6% of those with any thallium at all had levels between 2.1 and 4.0 μg/100 ml. The remaining 1.6% of the thallium containing population had levels greater than 4.0 μg/100 ml. Even for these 5 children with blood thallium content between 4.0 and 8.0 μg/100 ml, it is not felt likely that these levels represented a health hazard. Lead concentrations were also determined in the blood of these children. There was no significant correlation between lead and thallium contents. However, correlations among lead, cadmium, and mercury have already been established. Thus, it is suggested that the sources of thallium in children's blood differ from those of lead, cadmium, and mercury. It is stressed that thallium content of the blood is not a reliable indication of body burdens of thallium or of thallium intake, as thallium is removed rapidly from the blood and either deposited in other organs or excreted.

76-0028. Egan, H.; Hubbard, A. W. (Lab. Government Chem., London, England). **Analytical surveys of food.** *Br. Med. Bull.* 31(3): 201-208; 1975. (49 references)

Food surveillance in the United Kingdom is reviewed with emphasis on the strategy of food contamination surveys and specific trace contaminants of food. Included in the latter group are pesticide residues, chiefly residues of the organochlorine pesticides. The foods which have been examined for organochlorine insecticide residues have been primarily fatty in nature and include beef and mutton kidney fat, butter, milk, and eggs. Because of the finding of high dieldrin levels (10 mg/kg) in mutton fat, approval of the use of dieldrin-based sheep dips was withdrawn in January 1966; thereafter, the average and maximum dieldrin residues gradually decreased. BHC and dieldrin residues were lower in mutton fat from Australian and New Zealand animals, but the DDT residues in the New Zealand samples were markedly higher than those in the UK samples. In general, pesticide residue levels were lower in beef fat than in mutton fat, and have been gradually decreasing in both. PCB residues have consistently been found in milk, cereal, and fish. Limited surveys have also been made of specific organochlorine and organophosphorus insecticide residues in particular crops, and of bromide residues in cereals and pulses and triphenyltin residues in potatoes.

76-0029. Horvath, E.; Sipos, M.; Szeszak, F. (Hajdu-Bihar County Hygiene and Epidemiological Station, Debrecen, Hungary). **Talajba juto szervesfoszfateszter tipusu novenyvedoszerek vandorlasa es metabolizmusa. [Migration and metabolism of organophosphorus pesticides in the soil.]** *Budapesti Kozegeszsegugy* 4: 111-113; 1974. (6 references) (Hungarian)

Investigations concerning the migration of organophosphorus pesticides in soil are presented. Examinations of random samples revealed 0.06 ppm of parathion in potato, 0.002 ppm of dimethoate in radishes, lebaycid in onions, as well as methyl parathion in onions, radishes, potatoes, and carrots growing in soils contaminated with these pesticides in the previous year. Phosdrin, dichlorvos, and trichlorfon are rapidly degraded in the soil, while other pesticides, such as diazinon, dimethoate, methyl parathion, and malathion become inaccessible to biochemical or bacteriological degradation due to adsorptive or other strong bonds with soil components after an initial rapid degradation. The gradual accumulation of such bound organophosphorus pesticide residues in the ground, especially around warehouses and mixing shops, may well result in a reduction of the rate of degradation due to sterilization of the soil. Considerable methyl parathion residue levels were found in the soil and in well water 23 to 45 m from a pesticide warehouse.

76-0030. Milhaud, G.; Bechade, A.; Pinault, L. (Chaire Pharm. Toxicol., Ecole Nat. Vet. Alfort, France). **Relation entre la contamination du lait et la contamination de la nourriture des animaux par les insecticides organochlores. [Relationship between the contamination of milk and animal feed with organochlorine insecticides.]** *Bull. Acad. Vet. France* 47(7): 361-366; 1974. (6 references) (French)

Comparative measurements of the organochlorine insecticide residues in forage and cow's milk performed in the summer of 1971 and 1973 on small farms in France are presented. Forage samples investigated in 1971 contained 0.01 ppm of α-BHC, 0.06 ppm of lindane, 0.013 ppm of heptachlor epoxide, and traces of β-BHC and dieldrin. Milk samples from cows fed such forage during the same period contained 0.08 ppm of α-BHC, 0.19 ppm of β-BHC, 0.08 ppm of lindane, 0.44 ppm of heptachlor epoxide, and 0.18 ppm of dieldrin. Forage samples investigated in the summer of 1973 contained 0.005 ppm of α-BHC, 0.04 ppm of lindane, and 0.0 ppm of heptachlor epoxide. Milk samples collected during the same period contained 0.03 ppm of α-BHC, 0.1 ppm of β-BHC, 0.08 ppm of dieldrin, and more or less significantly reduced levels of lindane (0.07 ppm) and heptachlor epoxide (0.39 ppm). The findings indicate that contamination of milk with organochlorine pesticides is essentially determined by contamination of the forage.

76-0031. Viel, G. (Lab. Phytopharm., INRA, Paris, France). **Les residus de pesticides dans l'alimentation apercu sur les residus dans les cereales. [Pesticide residues in foods, estimated via residues in cereals.]** *Bull. Anc. Eleves Ec. Meun.* 261: 140-146; 1974. (7 references) (French)

General hygienic and toxicological problems of pesticide residues in cereals and other products of vegetable origin, and the origin of and standards for pesticide residues in grain and grain products are described. The maximum allowable residue levels in grain are set in view of the ADI value and of the pesticide dose necessary for the efficient treatment of the crops. Residues in grain may originate from the treatment of stocks or warehousing facilities, from the treatment of plants, and from the mixture of dressed seed stock with commercial grain. Dieldrin and 2,4-D are the principal pesticides used in seed, soil, and plant treatment which leave behind residues in grains, whereas lindane, benomyl, mancozeb, methyl thiophanate, and tridemorph form no detectable residues. Lindane, used in grain treatment, may cause considerable residue problems. Milling reduces the lindane content of flour considerably, with a simultaneous accumulation in bran. Considerable reduction of the pyrethrin and piperonyl butoxide residues in grains was observed during storage. Methyl bromide, used for fumigation, forms inorganic bromide in the grain a short time after fumigation.

76-0032. Gaeb, S.; Saravanja, V.; Korte, F. (Inst. Oekol. Chem. GmbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXIII. Irradiation studies of aldrin and chlordene adsorbed on a silica gel surface.** *Bull. Environ. Contam. Toxicol.* 13(3): 301-306; 1975. (12 references)

The UV (290 nm) conversion of aldrin and chlordene adsorbed on a silica gel surface was studied and the results compared with those of solid phase reactions in which the compounds were deposited on a glass surface.

The reaction products were analyzed by column chromatography. The major products of the UV conversion in the solid phase were the respective cross linked photoisomers; only minor amounts of epoxide were formed. In contrast, the major products of conversion on the adsorbed surface were the respective epoxides of aldrin and chlordene, only minor amounts of the photoisomerization products being formed. It is concluded that low levels of cyclodiene pesticides such as aldrin and chlordene adsorbed on airborne particulate matter may degrade via their epoxides and other oxidation products rather than their UV-photoisomerization products.

76-0033. Leidy, R. B.; Jackson, M. D.; Skroch, W. A.; Sheets, T. J. (N. C. Dep. Human Resources, Environ. Sci. Sect., Pestic., Residue Lab., Raleigh, NC 27611). **Residue studies with silvex in apples.** *Bull. Environ. Contam. Toxicol.* 13(3): 338-341; 1975. (4 references)

Aqueous sprays of four formulations of silvex (isooctyl ester, propylene glycol butyl ether ester, butoxyethanol ester, and acid) were applied at 1.1, 2.2, and 4.5 kg/ha to the ground cover and the bases of the apple trees in an orchard in Waynesville, North Carolina. The apples were analyzed for residues 33 and 49 days after application by electron capture gas chromatography. A similar experiment utilizing only the propylene glycol butyl ether ester of silvex was conducted in an orchard in Fletcher, North Carolina; samples were collected 29, 57, and 91 days after herbicide application. Silvex was not detected in any of the samples from either experiment; the lowest detectable limit was 0.05 ppm. These results indicate that spraying the grond cover and the bases of the tree trunks in apple orchards with silvex in amounts up to 4.5 kg/ha will not produce detectable residues in the apples.

76-0034. Kido, H.; Bailey, J. B.; McCalley, N. F.; Yates, W. E.; Cowden, R. E. (Dep. Entomol., Univ. California, Davis, CA 95616). **The effect of overhead sprinkler irrigation on methyl parathion residue on grape leaves.** *Bull. Environ. Contam. Toxicol.* 14(2): 209-213; 1975. (3 references)

Vines of mature Sauvignon blanc grapes were treated with methyl parathion sprays (0.75 lb active ingredient/acre) using an overhead sprinkler irrigation method. Mature Sylvaner grape vines were similarly treated using a concentrate spray (25 gal/acre) applied by a Windmill 350 sprayer or a dilute spray (100 gal/acre) with an inverted U-boom sprayer. Residue analyses of leaf punch samples collected from the Sauvignon blanc vineyards indicated that 90.2% of the surface methyl parathion residue was lost from the leaves 1 day after insecticide application and 95.7% was lost by the second day. In plots which were sprinkler irrigated on the night after insecticide application, the surface residues were reduced by 96.6% and 97.4% on the first and second days after application, respectively. The results from the Sylvaner vineyards indicated that the average initial surface deposit obtained from the plots treated with the concentrate sprays (19.3 ppm) was greater than that obtained from the plots treated with the dilute spray (10.7 ppm). Sprinkler irrigation at 1, 3, or 7 days after methyl parathion application had relatively little effect on the disappearance of residues from the leaf surfaces. No methyl paraoxon was found in the treated leaf samples.

76-0035. Yamato, Y.; Suzuki, M.; Akiyama, T. (Kitakyushu Municipal Inst. Environ. Health Sci., Kitakyushu, Japan). **Persistence of BHC in river water in the Kitakyushu District, Japan, 1970-1974.** *Bull. Environ. Contam. Toxicol.* 14(3): 380-384; 1975. (11 references)

Water samples were collected monthly between 1970 and 1974 from downstream sampling locations on the Onga and Murasaki Rivers, the two major rivers in the Kitakyushu District of Japan. The BHC residues in the samples were determined by electron capture gas chromatography. Following prohibition of the use of BHC in late 1970, the yearly maximum concentrations of residues in the water samples decreased logarithmically between 1970 and 1972; the concentrations did not change significantly thereafter. The total and gamma-BHC residue levels in the summer of 1974 were 307 ng/l and 46 ng/l, respectively, in the Onga river and 252 ng/l and 72 ng/l, respectively, in the Murasaki River. Variations in residue levels in the river water were due to the introduction of run-off water from the paddy fields and the volatilization of pesticides from the soil; thus the residue levels were higher in the summer than in the autumn or winter. The minimum residue levels (obtained during the winter) did not vary greatly throughout the period of investigation.

76-0036. Klemmer, H. W.; Leitis, E.; Pfenninger, K. (Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, Hawaii). **Arsenic content of house dusts in Hawaii.** *Bull. Environ. Contam. Toxicol.* 14(4): 449-452; 1975. (5 references)

A study was designed to obtain information regarding the concentration of arsenic residues in house dust. Dust samples were collected from vacuum cleaner sweepings screened through a 0.246 mm sieve. A total of 61 samples were analyzed. Levels of arsenic found in these samples ranged from 1.1 to 1080.0 μg As/g of sieved dust. In general, the higher levels were found in dusts obtained from homes where chemicals had been reportedly used in the control of termites. In other cases of high concentrations, the home owner was either an employee of a pest control firm or of a firm specializing in the treatment of construction lumber with wood preservative chemicals. Either the arsenic was brought home on clothing or arsenic was improperly used at home by the home owners. In a study of 46 dust samples, it was determined that "treated" homes tended to have significantly higher levels of arsenic in dust than did "untreated" homes. One source of the arsenic dust may be the copper acetoarsenite (Paris Green) used by home owners and pest control operators against

termite infestations. Another possible source could be copper-chrome-arsenic formulations or fluor-chrome-arsenic-phenol formulations used as wood preservatives. Some portion of the arsenic in house dust may also be derived from arsenical herbicides used on lawns or gardens and subsequently transferred via air or clothing to the interior of homes. However, reported usage of herbicides by 9 home owners involved in this study did not identify any arsenicals and levels of arsenic found in dusts from these homes were not elevated above the mean value for all treated homes.

76-0037. Andrade, P., Jr.; Wheeler, W. B.; Carlson, D. A. (Univ. Florida, Pesticides Res. Lab., Gainesville, FL 32611). **Identification of a mirex metabolite.** *Bull. Environ. Contam. Toxicol.* 14(4): 473-479; 1975. (8 references)

This paper presents data concerning the isolation and identification of a mirex metabolite formed by sewage sludge organisms taken from the anaerobic digester of the City of Gainesville's sewage treatment plant. The combined mass spectral, thin layer chromatography, and gas-liquid chromatography data for the metabolite and the mirex derivative standards obtained in this investigation suggest that the mirex metabolite formed is the 10-monohydro derivative. However, due to the lack of an authentic 9-monohydro standard for comparison, the possibility that the metabolite is the 9-monohydro derivative cannot be eliminated completely.

76-0038. Parejko, R.; Johnston, R.; Keller, R. (Dep. Biol., Northern Michigan Univ., Marquette, MI 49855). **Chlorohydrocarbons in Lake Superior lake trout (*Salvelinus namaycush*).** *Bull. Environ. Contam. Toxicol.* 14(4): 480-488; 1975. (12 references)

A study was made to determine the extent of chlorohydrocarbon contamination in fish taken from Lake Superior, a relatively isolated lake. It was felt that data from such a study would offer an insight as to the present status of the chlorinated hydrocarbon concentrations in lake trout fished commercially and as part of a sports fishery. Lake trout were netted during the summer of 1971. All tissue extracts from the 20 fish analyzed produced gas chromatographic peaks corresponding to some chlorohydrocarbon pesticide and/or polychlorinated biphenyl standard. Lindane was detected in only one fish, heptachlor in two, and aldrin in 12. The concentration of aldrin was always lower than the FDA action level of 0.3 ppm. The concentrations of heptachlor always exceeded this level. Total DDT and analogs were found in 18 fish. Chlorohydrocarbon pesticides not detected included: hexachlorocyclohexane (BHC), *p,p'*-DDA, *o,p'*-DDD, *m,p'*-DDD, α- and γ-chlordane, perthane, endrin, endosulfan, prolan, methoxychlor, and mirex. Every lake trout analyzed contained compounds identified as Aroclor PCBs.

76-0039. Sims, G. G.; Cosham, C. E.; Campbell, J. R.; Murray, M. C. (Environ. Canada, Fisheries and Marine Serv., Inspection Br., Halifax, Nova Scotia, Canada B3J 2S7). **DDT residues in cod livers from the maritime provinces of Canada.** *Bull. Environ. Contam. Toxicol.* 14(4): 505-512; 1975. (16 references)

A number of cod liver samples (*Gadus morhua*) were collected at 6 sampling sites off the Atlantic Coast of the Maritime Provinces of Canada during the summer of 1971. These samples were used to determine the residues of DDT and its analogs. The results of the study showed widespread distribution of DDT over the entire region studied. The cod liver samples from one particular area showed appreciably higher residue levels than those from the other 5 sites. This area, off Halifax, represents the collection site nearest the largest population center in the Maritime Provinces. Varying proportions of DDT and its metabolites were found. These variations may result from the proximity of the sampling site to the source of the parent compound, the time elapsed since the most recent application of the parent compound, the identity of the parent compound, and the aquatic biota which in different areas may vary in such a way as to affect the rates of degradation of these compounds. The results of the study again demonstrate the ability of chlorinated pesticides to accumulate in lipid rich tissues. Twelve cod livers, for example, had a mean ΣDDT level of 5.9 ppm while the corresponding flesh samples showed a mean level of only 0.040 ppm. In almost all samples analyzed for PCBs, the PCB residues were higher than the DDT residues.

76-0040. Suzuki, M.; Yamato, Y.; Watanabe, T. (Kitakyushu Munic. Inst. Environ. Health Sci., Kitakyushu, Japan). **Persistence of BHC (1,2,3,4,5,6,-hexachlorocyclohexane) and dieldrin residues in field soils.** *Bull. Environ. Contam. Toxicol.* 14(5): 520-529; 1975. (42 references)

BHC powder (active ingredient 3% lindane, applied at 3 kg/10 acres) was applied to a field (Sampling Station No. 1) in June 1972 to control cabbage pests. No pesticide was applied to Sampling Stations No. 2, 3, and 4 at this time, but all were known to have been treated with BHC and dieldrin prior to, but not after, 1971. Residue levels in the soil within these fields were determined using electron capture gas chromatography. In the soil of Sampling Station No. 1, the BHC isomer present in the largest quantity was the α-isomer, followed by the γ-, δ-, and β-isomers; α-BHC was the most readily dissipated. About 5 mo after pesticide application, a cabbage grown in this field was found to contain α-BHC (0.014 ppm), β-BHC (0.160 ppm), γ-BHC (lindane) 0.043 ppm, and δ-BHC (0.007 ppm). The soil of sampling Station No. 2 was not cultivated and none of the pesticide residues within it decreased during the 3-yr experimental period; slight increases in β- and γ-BHC were observed. In Sampling Station No. 3, which was used as a rice field, the BHC residues decreased rapidly at first but later remained virtually unchanged. Sampling Station No. 4 was cultivated twice in 1 yr; although the α-, γ-, and δ-BHC residues did not decline over the observation period, the β-BHC levels

residue decreased slightly. It appears that BHC in soil at low residue levels is resistant to microbial and physicochemical degradation.

76-0041. Ware, G. W.; Estesen, B.; Cahill, W. P. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721). **Dislodgable insecticide residues on cotton.** *Bull. Environ. Contam. Toxicol.* 14(5): 606-609; 1975. (4 references)

Test plots within a 25-acre cotton field in La Palma, Arizona were treated with Supracide (0.5 lb methidathion/acre), Fundal (1.0 lb chlordimeform/acre), Sevimol (1.5 lb carbaryl/acre), methyl parathion (1.0 lb active ingredient/acre), toxaphene-methyl parathion (2.0+1.0 lb active ingredient/acre), Carzol (0.5 lb formetanate hydrochloride /acre), or Sevin (1.5 lb carbaryl/acre). Leaf punch discs collected 0-96 hr later were analyzed for pesticide residues by gas chromatography. The results indicated that toxaphene protected methyl parathion from dissipation to a significant extent. Fundal was sorbed by the leaf or volatilized quite rapidly, only trace residues being found at any time after application. Sevin and Sevimol were the most persistent of the materials tested, followed by the toxpahene-methyl parathion combination. The other materials left no significant dislodgable residues beyond 24 hr.

76-0042. Anonymous. **NIEHS' David Rall.** *Environ. Sci. Technol.* 8(13): 1065-1068; 1974.

During a question and answer session regarding the work of the National Institute of Environmental Health Sciences, a question was raised about the current body burdens of environmental pollutants. It was noted that the levels of DDT are decreasing, in conjunction with its decreased use. In 1966 the intake of DDT and DDE was 0.069 mg/day, corresponding to a high of 7.6 ppm in body fat. The corresponding figure for 1970 was 0.025 mg/day for intake of DDT and DDE. In 1971 the content of DDT and DDE in body fat was less than 6.0 ppm.

76-0043. Fisher, I. L.; Tadjer, G.; Aufricht, W. (Tel Aviv, Israel). **Chlorinated insecticides in the body fat.** *Forensic Sci.* 5(2): 126; 1975.

The amount of chlorinated insecticides was studied which had accumulated in the body fat of people not occupationally exposed to such insecticides. Analyses were made over the past 20 years in various countries of the world. Most often these studies were concerned with DDT and its metabolite DDT. The more toxic compounds such as endrin, aldrin, dieldrin, BHC, and heptachlor were studied less often. Fifty samples were taken at autopsies. Gas chromatographic methods were employed. All samples were found to contain *p,p'*-DDT (1.48 ppm) and DDE (10.8 ppm); total DDT, 11.66 ppm. BHC was found in 33 cases, at 0.18 ppm; *o,p'*-DDT in 3 cases; DDD in 2 cases; aldrin and dieldrin, in one case each.

76-0044. Malkomes, H. P.; Hoffmann, G. M. (Inst. Pflanzenkrankh. Pflanzensch., Tech. Univ. Hannover, Hanover, Germany). **Zur Verringerung der Bromidaufnahme von Gemuesepflanzen nach einer Bodenbegasung mit Methylbromid (Terabol).** [**The diminution of bromide uptake into vegetable plants following soil fumigation with methyl bromide.**] *Gartenbauwissenschaft* 40(1): 1-11; 1975. (82 references) (German)

The dynamics of bromide residues in soil and vegetables were studied after soil fumigation with methyl bromide under different conditions. After fumigation at a rate of 50 g/m² for 48 hr before planting, the bromide levels in ripe tomatoes were around 50 ppm, while soil fumigation with 25 g/m² doses or for 24 hr resulted in considerably reduced residue levels. It was possible to substantially reduce the bromine level in the upper 20 cm layer of the soil by leaching with water. Considerable reduction of the bromide levels in tomato, pepper, spinach, and radish was achieved by growing these vegetables as second crops, or following a prolonged idle period after fumigation.

76-0045. Molozhanova, E. G. (All-Union Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Kiev, USSR). Fakticheskoe soderzhanie sevina v ob''ektakh vneshney sredy i kolichestva preparata, sposobnye postupat' v organizm cheloveka. [**Actual amount of sevin in environmental substances and amounts of sevin capable of entering the human body.**] *Gig. Primen., Toksikol. Pestits. Klin. Otravlenii* 8: 170-174; 1970. (Russian)

Soil, plant, and water samples were analyzed for carbaryl residues after application in the prescribed doses, and the actual daily intake with food, water, and air was estimated. The carbaryl residues in groundwater and surface water ranged from 0.02 to 0.27 mg/liter, while soil samples contained 0.04 to 2.22 mg of carbaryl per kg. Analyses of plant samples at harvesting revealed 1.74 mg/kg in fruits, 0.69 mg/kg in vegetables, 0.82 mg/kg in forage crops, and 0.48 mg/kg in useful plants. Storage of fruits and vegetables for 90 days resulted in a reduction by 18-30% in the residue level, but peeling and washing with water reduced the residue content by 40%. Boiling reduced the residue by 45-90%, and 47-50% of the residues were transferred into juice. Ensilage of forage crops and drying of grass were most efficient in reducing the contamination of fodder. The daily intake of carbaryl was estimated to be 1.2 mg with fruits and vegetables, 0.33 mg with water, and 0.61 mg with air, in the case of occupational exposure. For comparison, the ADI has been set at 1.2 mg/day. Carbaryl accumulating in the soil can migrate into water, air, and plants. Soil residues of 1-2 mg/kg, accumulating after one-year treatment, do not interfere with the microflora, but treatment for two or more years results in the death of algae and stimulation of ammonifying microorganisms. Large concentrations of carbaryl depress ammonifying bacteria and stimulate nitrifying bacteria.

76-0046. Guseynov, M. K. (Salyany Central Hosp., Azerbaidzhan SSR, USSR). **K voprosu o tsirkulyatsii**

sevina vo vneshney srede. [Circulation of sevin in the environment.] *Gig. Primen., Toksikol. Pestits. Klin. Otravlenii* 8: 174-176; 1970. (Russian)

The migration of carbaryl in the environment was studied at different times after the application of a single 2 kg/ha dose on a cotton field. Carbaryl concentrations of 0.03-0.35 mg/kg were measured in the topsoil between 8 and 52 days after application. No residues were found in the 25-100 cm soil layer. Residue concentrations of 0.01-0.25 mg/l were found in 10 out of 32 water samples taken from irrigation ditches 200-300 m from the treated plot 3-18 days after application. Grass samples taken at distances over 250 m between the 25th and 45th days after application contained 0.18-0.25 mg/kg carbaryl. Cotton plant leaves contained 0.03 to 1 mg/kg carbaryl between 10 and 75 days after treatment. Certain fiber samples investigated between 14 and 30 days after treatment contained carbaryl at the 0.05 mg/kg level. Certain cottonseed samples contained 0.015 mg of carbaryl per kg 3.5 to 4 months after treatment. Traces of carbaryl were detected in cottonseed oil.

76-0047. Ivanova, L. N.; Russu-Lupan, I. T.; Belaya, L. L.; Fedorchenko, V. S.; Matusevich, T. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **O verifikatsii prognoza dinamiki pestitsidov v produktakh rastenievodstva. [Verification of predicted pesticide residue dynamics in farm produce.]** *Gig. Sanit.* 40(6): 105-107; 1975. (1 reference) (Russian)

The residue dynamics of 11 pesticides, including organochlorine and organophosphorus compounds, carbamates, and dithiocarbamates (toxaphene, strobane, methyl parathion, phosalone, trichlorfon, carbaryl, zineb, etc.) were studied in fruits and vegetables (apples, pears, cabbage, cucumbers, etc.) grown in different climatic zones of the USSR. The 2-yr study was designed to verify the mathematical prognosis of the residue levels and residue dynamics of pesticides in farm produce. The mathematical modeling method was developed by the All-Union Scientific Research Institute for Hygiene and Toxicology of Pesticides, Polymers, and Plastic Materials in cooperation with the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences. The comparison of the residue levels calculated and found shows good agreement, with an average deviation of 30%. The findings show that the residue levels are a function of many factors, such as the specific type of the preparation, mode of application, and plant species.

76-0048. Soderquist, C. J.; Crosby, D. G.; Moilanen, K. W.; Seiber, J. N.; Woodrow, J. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Occurrence of trifluralin and its photoproducts in air.** *J. Agric. Food Chem.* 23(2): 304-309; 1975. (21 references)

Trifluralin vapor photodecomposed to a number of products in a laboratory vapor-phase reactor which simulated sunlight conditions. For analysis, an air sampling method utilizing a coated solid adsorbent as a vapor trap was developed which trapped these materials at air flow rates greater than 1 m^3/min and with a limit of detectability of less than 1 ng/m^3. Trifluralin and several photoproducts were detected in the air above both surface treated and soil incorporated fields. These photoproducts probably arise primarily from photolysis of trifluralin on the soil surface followed by volatilization; however, the contribution of vapor-phase photolysis of trifluralin undoubtedly increases with increasing air residence time. (Author abstract reprinted by permission of the American Chemical Society)

76-0049. Peakall, D. B.; Cade, T. J.; White, C. M.; Haugh, J. R. (Ecol. Systematics Sect., Cornell Univ., Ithaca, NY 14850). **Organochlorine in Alaskan peregrines.** *Pestic. Monit. J.* 8(4): 255-260; 1975. (26 references)

Organochlorine residue levels in eggs of Alaskan peregrines have remained essentially constant over the period 1969-73 despite decreased usage of these compounds in the United States and Canada. Studies on reproductive success in Great Britain and data on eggshell-thinning suggest that DDE residues above 20 ppm wet weight in peregrine eggs are associated with inability to maintain population levels. Residues in mainland Alaska are well above this critical figure and the reproductive rate is low. On the Colville River in northwestern Alaska, the last young falcons will fledge in 1975 and the remaining adult population will disappear by 1980 unless the present rate of reproductive failure is drastically and quickly reversed. In the Aleutians, however, levels range from 5 to 7 ppm and the reproductive rate is adequate to maintain the population. (Author abstract by permission)

76-0050. Walker, A. (Weeds Sect., Natl. Veg. Res. Stn., Wellesbourne, Warwick, England). **A simulation model for prediction of herbicide persistence.** *J. Environ. Qual.* 3(4): 396-401; 1974. (10 references)

A simulation model for prediction of herbicide persistence in the field is described. The model combines the effects of soil temperature and soil moisture content on the rates of herbicide loss, determined experimentally under controlled conditions, with the fluctuations in surface soil temperature and moisture content in the field. The computer program includes methods of simulating surface soil temperatures and moisture contents from standard meteorological data. In order to test the model, the degradation of napropamide (2-(α-naphthoxy) -*N*,*N*- diethylpropionamide) was examined. Under controlled conditions, loss of activity followed first-order kinetics with half-lives of 54, 63, and 90 days at 28°C with soil moisutre contents of 10.0, 7.5, and 3.5%, respectively. At 14°C, half-lives at 10.0 and 7.5% soil moisture were 102 and 112 days, respectively. When these data were used in the simulation model in conjunction with the relevant meteorological information, the patterns of loss of napropamide incorporated 2 to 3 cm in the field could be

predicted. Napropamide was lost rapidly when applied to the soil surface, and since the model only takes into account losses through microbial or chemical metabolism, this could not be simulated. Some of the limitations and the potential benefit of the simulation technique for prediction of pesticide persistence are discussed. (Author abstract by permission)

76-0051. Yaron, B.; Bielorai, H.; Kliger, L. (Div. Soil Residue Chem., Inst. Soils Water, ARO, Volcani Cent., Bet Dagan, Israel). **Fate of insecticides in an irrigated field: azinphosmethyl and tetradifon cases.** *J. Environ. Qual.* 3(4): 413-417; 1974. (7 references)

The fates of an organophosphorus (azinphosmethyl) and an organochlorine insecticide (tetradifon) in an irrigated potato field on a loessial sierozem soil were studied. Two amounts of irrigation water (5538 and 4015 m^3/ha) were applied; the kinetics of persistence and the movement downward of the two pesticides were followed during the irrigation season. The azinphosmethyl was not transported deeply into the soil by the irrigation water, and it disappeared from the field 30 days after application. The tetradifon was found in trace amounts in the deeper layer of the soil and was persistent throughout the irrigation season. The pesticides' persistence was not affected by the irrigation treatments; however, tetradifon transport into the soil was affected by the amount of water applied. Residues of tetradifon were found in the potato peel. (Author abstract by permission)

76-0052. Sopper, W. E. (Sch. For. Resources, Pennsylvania State Univ., University Park, PA 16802). **Effects of timber harvesting and related management practices on water quality in forested watersheds.** *J. Environ. Qual.* 4(1): 24-29; 1975. (22 references)

Undisturbed forested watersheds are generally recognized as a primary source of high-quality water. The physical and chemical nature of these waters fluctuates constantly in response to natural stresses but is most extensively influenced by man's activities. Three major forest land management activities—timber harvesting, fertilization, and herbiciding—which may have an adverse effect on water quality are reviewed. In general, research results indicate that nutrient losses, particularly nitrogen, following forest clearcutting are small to negligible. Similarly, forest fertilization studies indicate that nitrogen concentrations in streams are not drastically increased. Herbicides used as forest management tools may create water quality problems. Studies have been conducted in Northwest forests using 12 kg/ha each of 2,4-D and 2,4,5-T, 24 kg/ha amitrole, and 2 kg/ha dicamba. Results were consistent despite differences in chemicals, season of application, and nature of the treated area. Peak concentrations reached in forest streams were: 0.013 mg/l (2,4-D); 0.012 mg/l (2,4,5-T); 0.110 mg/l (amitrole); and 0.037 mg/l (dicamba). Contamination was primarily due to drift or direct application to surface water. No tests detected residues in forest streams longer than 1 mo after application in 8 yr of monitoring. Large areal applications of these herbicides have demonstrated that, if carefully applied, they can be used without impairment of water quality. (Author abstract by permission, suppl.)

76-0053. Bovey, R. W.; Burnett, E.; Richardson, C.; Baur, J. R.; Merkle, M. G.; Kissel, D. E. (USDA, ARS, College Station, TX 77843). **Occurrence of 2,4,5-T and picloram in subsurface water in the Blacklands of Texas.** *J. Environ. Qual.* 4(1): 103-106; 1975. (12 references)

This investigation was conducted to determine the concentration of 2,4,5-T [(2,4,5-trichlorophenoxy)acetic acid] in subsurface water after spray applications of the herbicides to the surface of a seepy area watershed and lysimeter in the Blacklands of Texas. A 1:1 mixture of the trimethylamine salts of 2,4,5-T picloram was sprayed at 2.24 kg/ha every 6 months on the same area for a total of five applications. Herbicide content of the Houston Black clay during the study ranged from 0 to 162 ppb. Herbicide content on grass was high (28 to 113 ppm) immediately after spraying, but degraded rapidly after each treatment. Concentration of 2,4,5-T and picloram in seepage and well water from the treated area was extremely low (< 1 ppb) during the 3-year study. No 2,4,5-T was detected in 122 drainage samples from a field lysimeter sampled for 1 year after treatment with 1.12 kg/ha of 2,4,5-T picloram (1:1). Picloram was detected in small amounts (1 to 4 ppb) 2 to 9 months after treatment in lysimeter water. (Author abstract by permission)

76-0054. LaFleur, K. S.; McCaskill, W. R.; Adams, D. S. (Clemson Univ., Clemson, SC 29631). **Movement of prometryne through Congaree soil into ground water.** *J. Environ. Qual.* 4(1): 132-133; 1975. (6 references)

Prometryne [2,4-bis(isopropylamino)-6-(methylthio)-*s*-triazine] (2.54 g/m^2) was applied to a Congaree sandy loam fieldplot containing a shalow (about -1.1 m) water table. Movement and loss in the soil profile and accumulation in underlying ground water were monitored for 16 months. Rainfall during this time was 182 cm (3.5 pore volumes, based on the upper meter of soil.) The upper meter contained about 31% of the applied prometryne after 16 months. Prometryne concentration was greatest in the 0- to 20- cm layer throughout the experiment. Loss of prometryne with time in the upper 1 m was almost independent of concentration. Time to one-half concentration was about 10 months. Prometryne appeared in the underlying ground water within 2 months after soil application and persisted through the 16th month. It had disappeared from the ground water in a post-experiment check made after 20 months. Maximum concentration (8th to 16th month) was about 0.2 μmol/liter. (Author abstract by permission)

76-0055. Baldwin, F. L.; Santelmann, P. W.; Davidson, J. M. (Univ. Arkansas, Little Rock, AR 72203). **Movement of fluometuron across and through the soil.** *J. Environ. Qual.* 4(2): 191-194;1975. (10 references)

Experiments were conducted to determine the effect of rainfall intensity, antecedent soil moisture, and time and subsequent rainfall on the runoff and leaching of soil-applied fluometuron [1,1-dimethyl-3- (α,α,α- trifluoro-*m*-tolyl) urea]. Fluometuron was applied to specially constructed field plots on a 1% slope and a simulated rainfall procedure was used to produce runoff. Runoff water and sediment, as well as vertical soil samples, were collected and analyzed for herbicide concentrations. The highest fluometuron concentrations were found on the sediment portion of the runoff, but the highest losses occurred in the liquid portion of the runoff. These losses were caused by the larger volume of water compared to sediment leaving the plot. The first 3.78 liters of runoff water leaving the plot contained a higher concentration of fluometuron than did a composite of the next 41.6 liters. Antecedent soil moisture had a greater effect on runoff losses than did rainfall intensity. Higher losses occurred when the herbicide was applied to a wet soil than to a dry soil. Fluometuron could not be detected in the runoff water collected 1 month after the first runoff-producing water application. Total herbicide losses from each experiment were 1% or less of the total amount applied. Fluometuron was leached to the 5- to 10-cm soil depth with some treatments showing small quantities of herbicide in the 10- to 20-cm layer. (Author abstract by permission)

76-0056. Edwards, A. C.; Davis, D. E. (Dep. Bot. Microbiol., Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830). **Effects of an organic arsenical herbicide on a salt marsh ecosystem.** *J. Environ. Qual.* 4(2); 215-219; 1975. (15 references)

The effects of single and repeated applications of monosodium methanearsonate (MSMA) on the standing crops of smooth cordgrass (*Spartina alterniflora* L.), a periwinkle (*Littorina irrorata* Say), and a rib mussel (*Modiolus demissus* Dillwyn) were investigated. Treatments applied were as follows: (i) single foliar application of 90,000 ppm; (ii) 30 foliar applications of either 10,000, 1,000, 100, 10, or 0 ppm; and (iii) 30 floodings of enclosed areas of the salt marsh with 100 or 0 ppm MSMA. Post-treatment sampling revealed: (i) no treatment altered the density of smooth cordgrass; (ii) 30 applications of 10,000 ppm decreased the dry weight of living smooth cordgrass; (iii) flowering shoot production was reduced by 30 applications of 10,000 or 1,000 ppm; (iv) one application of 90,000 ppm and 30 applications of 10,000 or 1,000 ppm increased the percentages of dead and necrotic tissue on living shoots of smooth cordgrass; and (v) the periwinkle population was decreased by 30 applications of 10,000 ppm. None of the other treatments showed any significant effects on these parameters. Survival of the rib mussel was apparently not affected by flooding with 100 ppm in sea water. Arsenic levels in smooth cordgrass and soil samples were significantly increased by 30 foliar applications of 10,000 ppm or flooding 30 times with 100 ppm. Arsenic levels in periwinkles and rib mussels also increased immediately following these treatments with MSMA. (Author abstract by permission)

76-0057. Wauchope, R. D. (South. Weed Sci. Lab., ARS, USDA, Stoneville, MS 38776). **Fixation of arsenical herbicides, phosphate, and arsenate in alluvial soils.** *J. Environ. Qual.* 4(3): 355-358; 1975. (36 references)

The sorption of arsenic (as arsenate), phosphate, DSMA (disodium methanearsonate), and the sodium salt of cacodylic acid (hydroxydimethylarsine oxide) by 16 Mississippi River alluvial flood plain soils was measured in a slurry experiment in which initial pH and solute molar solution concentrations for all four solutes were identical. Sorption of the two organoarsenical herbicides was strongly correlated with arsenate and phosphate sorption, and sorption of all four species was strongly correlated with clay and iron oxide content of the soils. In 1 to 0.1 m*M* solution, the arsenicals are more strongly sorbed than phosphate, with sorption increasing in the order P < cacodylate < arsenate ≈ methylarsonate. (Author abstract by permission)

76-0058. Willis, G. H.; Rogers, R. L.; Southwick, E. M. (South. Reg., Agric. Res. Serv., USDA, Baton Rouge, LA 70803). **Losses of diuron, linuron, fenac, and trifluralin in surface drainage water.** *J. Environ. Qual.* 4(3): 399-402; 1975. (27 references)

Diuron [3-(3,4-dichlorophenyl) -1,1- dimethylurea], linuron [3-(3,4-dichlorophenyl) -1-methoxy-1- methylurea], fenac [(2,3,6-trichlorophenyl) acetic acid], and trifluralin (α,α,α-trifluoro -2,6- dinitro -*N*,*N*- dipropyl -*p*- toluidine) were applied to plots designed for sampling surface runoff. Over a 3-year period, highest concentrations in runoff were usually associated with rainstorms that occurred soon after application. Maximum seasonal losses were < 0.12, 0.30, 2.90, and 0.05% of the applied diuron, linuron, fenac, and trifluralin, respectively. The data suggest that with proper use on agricultural land in the lower Mississippi River Valley these herbicides pose little threat to adjacent aquatic areas. (Author abstract by permission)

76-0059. Mel'nikov, N. N. (All-Union Sci. Res. Inst. Chemical Means Plant Protect., USSR). **Pestitsidy i okruzhayushchaya sreda. Gamma-geksakhlortsiklogeksan (Obzor literatury). [Pesticides and the environment. Gamma-hexachlorocyclohexane. (Literature review.)]** *Khim. Sel'sk. Khoz.* 12(9): 631-635; 1974. (55 references) (Russian)

Studies on the environmental distribution, residue dynamics, and metabolism of lindane are reviewed. Lindane concentrations of 2,600-12,500 mg/m^3 were measured

in a forest after spraying with lindane. Soil samples investigated in the USA, Japan, England, and other countries contained 0.04-0.26 mg of lindane per kg. Due to its volatility, lindane is entrained by water by vapor into the atmosphere. Forage samples analyzed in Japan contained 0.007-0.935 mg of lindane per kg. Tomato and cow's milk samples were found to contain 0.105 and 0.002 mg of lindane per kg. Lindane accumulates to a far lesser degree in fatty tissues than does DDT. Human fatty tissues investigated in different countries contained 0.07-1.06 mg of lindane per kg. In living organisms, lindane is metabolized, primarily to pentachlorocyclohexane isomers. The phenols formed in warm-blooded organisms are eliminated with urine and feces in the form of acid sulfates or glucuronides. All isomers of di-, tri- and tetrachlorophenols were found in rats. Hexachlorocyclohexane and pentachlorocyclohexane react with the amino acid sulfhydryl groups in insects. The phenols formed by soil microorganisms are subject to further total destruction.

76-0060. Baida, T. A. (Kazakh Inst. Plant Protect., USSR). **Dinamika i metabolizm khlorofosa v rasteniyakh kapusty i luka. [Dynamics and metabolism of chlorophos in cabbage and onion plants.]** *Khim. Sel'sk. Khoz.* 13(1): 67-68; 1975. (4 references) (Russian)

The residue dynamics and metabolism of chlorophos (trichlorfon) were studied in cabbage and onion plants 1 to 30 days after treatment with 0.2% solution at a rate of 1,200 liter/ha. The residues were determined by thin-layer chromatography. The residue in cabbage leaves was within the maximum allowable concentration of 1 mg/kg one day after treatment, while the concentration of hydrolyzed trichlorfon was rather high. The waiting time to be observed after trichlorfon treatment of cabbage is recommended to be 10 days. The residue dropped to below the maximum allowable concentration in onion plants within 7 days after the first treatment and 15 days after the second treatment. Small quantities of DDVP (dichlorvos) were found in cabbage and onion plants. The DDVP degraded rather rapidly within 10 days.

76-0061. Vengorek, V.; Matskevich, S.; Troyanovski, Kh. (Inst. Plant Protect., Poznan, Poland). **Vliyanie pestitsidov na urozhay sel'skokhozyaystvennykh kul'tur i nekotoryye elementy biotsenoza zashchishechaemykh poley. [The effect of pesticides on farm crop yields and on certain elements of the biocenosis of the fields treated.]** *Khim. Sel'sk. Khoz.* 13(6): 467-472; 1975. (12 references) (Russian)

The effect of pesticides on crop yield, soil microfauna, and pesticide residues in the soil and plant was studied in two different crop rotations (potato-barley-pea-wheat and sugar beet-oats with clover-clover-winter rape). The pesticides used were aldrin, chlorfenvinphos, DDT, fenitrothion, carbaryl, lindane, methoxychlor, demeton-methyl sulfoxide, phenylmercury acetate, thiram, zineb, diquat, dinoseb, DNOC, metobromuron, monolinuron, MCPA sodium salt, sodium trichloroacetate, and 2,4-D sodium salt. The residue analysis in soil samples, performed in different years, showed no accumulation of lindane and thiram in the soil. In general, the organochlorine pesticide residue levels were significantly higher than in the control plots. The mercury levels showed no significant difference from the control. The lindane, DDT, DDT metabolite, and thiram residue levels showed no significant difference from the control in clover and peas. The prolonged use of pesticides over many years failed to cause any significant change in the species distribution of Collembola and Acarina in the soil.

76-0062. Novozhilov, K. V.; Smirnova, I. M. (All-Union Inst. Plant Protect., USSR). **Dlitel'nost' sokhraneniya metilnitrofosa na rasteniyakh pshenitsy i kapusty. [Persistence of methyl nitrophos on wheat and cabbage plants.]** *Khim. Sel'sk. Khoz.* 13(8): 580-583; 1975. (11 references) (Russian)

The persistence of methylnitrophos (fenitrothion) in wheat and cabbage plants was studied under laboratory and field conditions, using 0.5% and 1% emulsions of the preparation at a dose of 100 liter/ha. The methylnitrophos content in the plants treated with 0.5% emulsion was consistently lower than in those treated with 1% emulsion. In laboratory tests, the methylnitrophos residue in wheat plants was highest during the first two days after treatment. No residue was detected in wheat plants eight days after treatment with 0.5% emulsion, but residues were found even on the 11th day after treatment with 1% emulsion. The methylnitrophos concentration in cabbage leaves was lower and decreased more rapidly than in wheat plants. Methylnitrophos was found in wheat ears for three days after treatment with 0.5% emulsion under field conditions, and 0.3 mg/kg was found in ears of plants treated with 1% emulsion on the ninth day. Wheat stalks contained 1.3 mg and 3.7 mg of methylnitrophos per kg on the ninth day after treatment with 0.5% and 1% emulsions. The rate of degradation of the pesticide was found to increase with increasing radiation intensity and temperature.

76-0063. Guingamp, M. F.; Alais, C. (Dep. Appl. Biol. I.U.T., Nancy, France). **Degradation des pesticides organochlores par les traitements technologiques. [Degradation of organochlorine pesticides by technological treatment processes.]** *Lait* 54(538): 589-599; 1974. (11 references) (French)

The effect of heat treatment, UV irradiation, hydrogen peroxide, and storage on the degradation of dieldrin, heptachlor, heptachlor epoxide, aldrin, lindane, and α-BHC at the 1 ppm level was studied in butterfat and in pasteurized milk. Heating at 200°C for 5 hr resulted in 25% degradation of lindane and α-BHC, while the other pesticides degraded at negligible rates only. Heating at 300°C for 3 hr degraded α-BHC totally, and lindane was degraded

at 300°C in 4 hr. The degradation rate was lowest for dieldrin and highest for aldrin among the other pesticides. Cyclohexane derivatives proved to be most stable in UV irradiation at 254 nm, while methanoindene and dimethanonaphthalene derivatives degraded most readily. Degradation rates over 75% were achieved in 5 hr for heptachlor epoxide, heptachlor, aldrin, and dieldrin. Treatment with 0.03% hydrogen peroxide resulted in 15% degradation of α- and β-BHC, while the degradation rates were 18% for lindane, 28% for heptachlor epoxide, and 45% for dieldrin. Long-term storage in pyrex glass containers resulted in a certain degree of photodegradation of aldrin. No degradation was observed in the case of α-BHC, lindane, and dieldrin. No heptachlor epoxide was formed by heptachlor during storage. Traces of dieldrin were found in aldrin-containing samples exposed to light.

76-0064. Baluja-Marcos, G. (Pestic. Environ. Pollut. Study Group, Organic Chem. Inst., Madrid, Spain). **Los plaguicidos como contaminantes ambientales y alimentarios. [Pesticides as environmental and food contaminants.]** *Medicamenta* 61(508): 125-132; 1973. (Spanish)

A review is given of the principal problems involved in using insecticides, especially the nondecomposing organochlorine variety, the environmental factors contributing to the spread of pollution, its biological effects, and the difficulties encountered in making accurate determinations of the effect of pesticide pollution on the biosphere and human health. Special features include the summarized results of a study of organochlorine residues in sardines caught off the coast of Palamos and Barcelona, Spain, in January 1970, and off the coast of Castellon, Vigo and Santander in June 1970. Figures are given for α-BHC, lindane, aldrin, dieldrin, DDE, TDE, and polychlorinated biphenyls (PCB). These results are also tabulated in relation to the daily acceptable human intake of such substances. Also included is a summary of the LD50 for rats of all the principal pesticides.

76-0065. Bidleman, T. F.; Olney, C. E. (Dep. Food Resource Chem., Univ. Rhode Island, Kingston, RI 02881). **Long range transport of toxaphene insecticide in the atmosphere of the western North Atlantic.** *Nature* 257(5527): 475-477; 1975. (13 references)

A study has been made that reveals that toxaphene is carried out to sea through the atmosphere to a distance of at least 1,200 km. The samples analyzed for this study were taken by drawing 200-3,000 m^3 of air through a Gelman A glass fiber and then through plugs of polyurethane foam. Less than 5% of the toxaphene was retained by the glass fiber filters; the bulk was found on the foam plugs. Toxaphene was identified by electron capture gas chromatography after separation from PCB, DDT, and chlordane by silicic acid column chromatography. The mean levels of toxaphene in western North Altantic air were about equal to or twice the amount of PCBs, and more than 10 times those of other pesticides so far reported in the marine atmosphere. These higher residues are thought to result from both the large scale use of toxaphene and its volatility. The mean toxaphene concentration (ng/m^3) in the 56 samples taken from Bermuda and RV Trident was 0.63, as against 0.024 for *p,p'*-DDT. A possible source of airborne toxaphene is the southern US cotton growing areas, where the bulk of this pesticide has been used in combination with DDT (up to 1973) and methyl parathion.

76-0066. Claeys, R. R.; Caldwell, R. S.; Cutshall, N. H.; Holton, R. (Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR 97331). **Residues in fish, wildlife, and estuaries.** *Pestic. Monit. J.* 9(1): 2-10; 1975. (13 references)

Concentrations of chlorinated pesticides and polychlorinated biphenyls (PCB's) were determined in three offshore marine species from the Oregon Washington coast: pink shrimp, euphausiids, and flatfish; five species of bivalve mollusks from five estuaries along the Oregon coast; several fish species from the Coos Bay and Columbia River estuaries; and a summer run of steelhead from the Rogue River. The compounds *p,p'*-DDE and PCB's were detected most frequently. Euphausiids and pink shrimp contained approximately 2 ppb ($\mu g/kg$) wet-weight DDE and 8 and 25 ppb PCB's respectively. Offshore flatfish contained an average of 9 ppb DDE and 29 ppb PCB's. DDE residues in estuarine mollusks approximated 0.5 ppb. PCB levels were not detectable (< 3 ppb) except in collections from the mouth of the Columbia River where levels averaged 400 ppb PCB's and 17 ppb DDT. Selected Columbia River fish species contained 38 ppb DDE and 480 ppb PCB's; summer-run steelhead in the Rogue River contained 97 ppb DDE and 125 ppb PCB's. PCB chromatograms of most euphausiids closely resembled those of Aroclor 1254. Chromatograms of shrimp and flatfish indicated selective metabolism of two compounds in the Aroclor 1254 formulation. Biphenyls of higher chlorine content were also detected in the shrimp and flatfish. (Author abstract by permission)

76-0067. Cromartie, E.; Reichel, W. L.; Locke, L. N.; Belisle, A. A.; Kaiser, T. E.; Lamont, T. G.; Mulhern, B. M.; Prouty, R. M.; Swineford, D. M. (Patuxent Wildl. Res. Cent., Fish Wildl. Serv., U. S. Dep. Inter., Laurel, MD 20811). **Residues of organochlorine pesticides and polychlorinated biphenyls and autopsy data for bald eagles, 1971-72.** *Pestic. Monit. J.* 9(1): 11-14; 1975. (8 references)

Thirty-seven bald eagles found sick or dead in 18 States during 1971-72 were analyzed for organochlorine pesticides and polychlorinated bilphenyls (PCB's). DDE and PCB's were detected in all bald eagle carcasses; 30 carcasses contained DDD (TDE) and 28 contained dieldrin. Four eagles contained possibly lethal levels of dieldrin and nine eagles had been poisoned by thallium. Autopsies revealed that illegal shooting was the most common cause of mortality. Since 1964 when data were first collected, 8 of the 17 eagles obtained from Maryland, Virginia, South Carolina, and Florida possibly died from dieldrin poisoning; all four specimens from Maryland and Virginia were from the Chesapeake Bay Tidewater area. (Author abstract by permission)

76-0068. Greig, R. A.; Wenzoloff, D.; Shelpuk, C. (Natl. Mar. Fish. Serv., Middle Atlantic Coastal Fish. Cent., Milford Lab., Milford, CT 06460). **Mercury concentrations in fish, North Atlantic offshore waters—1971.** *Pestic. Monit. J.* 9(1): 15-20; 1975. (9 references)

Mercury concentrations were determined in muscle and liver of 41 species of fish and a limited number of plankton, sediment, and invertebrate samples collected from North Atlantic offshore waters in 1971. The average mercury concentration in fish muscle was 0.154 ppm with a standard deviation of 0.124. Invertebrate samples had mercury concentrations which were generally less than 0.1 ppm. In a single lobster sample, however, 0.31 ppm mercury was found in the tail muscle and there was 0.60 ppm in the liver. Mercury levels in all 9 plankton and 10 sediment samples taken were less than 0.05 ppm. (Author abstract by permission)

76-0069. Veith, G. D. (Natl. Water Qual. Lab., U. S. Environ. Protect. Agency, Duluth, MN 55804). **Baseline concentrations of polychlorinated biphenyls and DDT in Lake Michigan fish, 1971.** *Pestic. Monit. J.* 9(1): 21-29; 1975. (24 references)

Responding to the recommendations of the Lake Michigan Interstate Pesticide Committee, the study aimed to establish baseline data on polychlorinated biphenyls (PCB's) and DDT in Lake Michigan fish in 1971. The study also attempted to gauge the impact of cooperative legislative action on the quality of large lakes. Thirteen species of fish taken from 14 regions of Lake Michigan in the fall of 1971 were analyzed for PCB's and DDT analogs. Mean wet-weight concentrations of PCB's similar to Aroclor 1254 ranged from 2.7 ppm in rainbow smelt to 15 ppm in lake trout. Most trout and salmon longer than 12 inches contained PCB's at concentrations greater than the tolerance level of 5 ppm established by the Food and Drug Administration, U.S. Department of Health, Education, and Welfare. Mean concentrations of total DDT ranged from less than 1 ppm in suckers to approximately 16 ppm in large lake trout. The presence of the major chlorinated hydrocarbons was confirmed by gas-liquid chromatography/mass spectrometry; additional PCB confirmations were obtained through perchlorination. The most abundant PCB's were tetra-, penta-, hexa-, and heptachlorobiphenyls which are similar to commercially prepared Aroclor 1254; lesser chlorinated PCB's were present in fish from nearshore waters. (Author abstract by permission)

76-0070. Brown, J. R.; Chow, L. Y.; Chai, F. C. (Sch. Hyg., Univ. Toronto, Toronto, Ontario, Canada). **Distribution of organochlorine pesticides in an agricultural environment, Holland Marsh, Ontario—1970-72.** *Pestic. Monit. J.* 9(1): 30-33; 1975. (7 references)

Analysis of organochlorine pesticides in soil, fish, and human blood samples from Holland Marsh, Ontario, indicates that although total DDT is present in detectable amounts, it does constitute a hazard to human health and longevity. Among soils tested, residues were highest in surface samples. DDT levels in human blood samples were similar to those in U.S. and British studies. (Author abstract by permission)

76-0071. Burns, B. G.; Peach, M. E.; Stiles, D. A. (Acadia University, Wolfville, Nova Scotia, Canada). **Organochlorine pesticide residues in a farming area, Nova Scotia—1972-73.** *Pestic. Monit. J.* 9(1): 343-38; 1975. (9 references)

Soil, silt, and water samples from the Habitant Creek watershed, Nova Scotia, a tobacco-growing area, have been monitored for organochlorine insecticides. Most samples contain measurable quantities of many persistent pesticides used in farming during the past decade. Sediment levels indicate that residues settle in sluggish parts of the stream. Drainage ditches show highest residual content caused in part by mass transport of soil in runoff. Residue content of water samples is normally one-tenth to one-hundredth that of silt, but is much higher during periods of heavy runoff. Levels vary with the seasons and are highest in the fall, decrease through the spring and summer, and are lowest in the winter. Although samples of well water taken fairly close to the stream showed virtually no residual content, a natural drainage reservoir had a pesticide content similar to that in the stream. (Author abstract by permission)

76-0072. Reimond, R. J. (Mar. Resources Ext. Cnt., Univ. Georgia, Brunswick, GA 31520). **Chlorinated hydrocarbon pesticides and mercury in coastal biota, Puerto Rico and the U. S. Virgin Islands—1972-74.** *Pestic. Monit. J.* 9(1): 39-43; 1975. (9 references)

Baseline levels of mercury and chlorinated hydrocarbons were determined for Caribbean coastal biota as part of the U.S. Environmental Protection Agency estuarine monitoring program. Forty-one percent of the 150 environmental samples taken had significant levels of these compounds. Concentrations of chlorinated hydrocarbons suggest spatial and temporal variations within the plant or animal. In some cases residues in biota could be related to the land-use practices in the sampled watershed. (Author abstract by permission)

76-0073. Mickerson, P. R.; Barbehenn, K. R. (Div. Tech. Assist., Fish Wildl. Serv., U.S. Dep. Inter., Washington, DC 20240). **DDT residues in starlings, 1974.** *Pestic. Monit. J.* 9(1): 1; 1975. (1 reference)

In a preceding study it was suggested that the mean level of DDT plus metabolites in starlings should drop below 0.1 ppm for the 1974 collection. The prediction was based on an analysis of the relationship between mean levels of DDT and its metabolites in starlings and estimates of domestic disappearance of DDT. The present brief summarizes initial findings from the 1974 starling collection. Further research indicates earlier estimates for disappearance of total DDT were optimistic: the geometric mean for 1974 was 0.282, a 36 percent reduction from the 1972 mean of 0.442. (Author abstract by permission)

76-0074. Combs, G. F., Jr.; Brewer, R. N.; Williams, N. K.; Richburg, R. W. (Dep. Poult. Sci., Auburn Univ., Auburn, AL 36830). **Dieldrin dilution in visceral fat of field-contaminated broilers.** *Poultry Sci.* 54(5): 1713-1716; 1975. (9 references)

Broilers aged 4, 5, and 6 weeks were selected from 8 commercial flocks which had been accidentally exposed to dieldrin in feeds. The birds were given a dieldrin-free ration and were reared to 10 weeks of age. Dieldrin residues in visceral fat were determined weekly. Results indicated that dieldrin residues are rapidly diluted in the growing chick with a half-time for dilution of approximately 12 days. (Author abstract by permission)

76-0075. Borsella, J. (National Bureau of Animal Health, Department of Agriculture, Buenos Aires, Argentina). **Problemas de los pesticidas en el comercio internacional de alimentos de origen animal. [Pesticide problems in the international animal-origin food trade.]** *Rev. Vet. Venez.* 32(191): 387-406; 1972. (Spanish)

More than 900 residue tests performed by SENASA (Argentine National Office of Animal Health) laboratories indicate an absence of insecticide residue problems in Argentine meat and meat products, with improvements still being made. In 1968, 27% of the samples tested had been above tolerance level, declining to 5.15% in 1969 (2.3% by December) and to less than 1% in 1970 and 1971. In 1970, Argentina used 30,000 tons of pesticides. Domestic pesticides consisted of 35% insecticides, 45% herbicides and 20% fungicides. The imported variety consisted of 54% insecticides and 29% fungicides. The USA constitutes the principal world market for meat (45 million dollars in 1967). Argentine decree No. 647 of 1968 prohibited use of dieldrin and heptachlor; decrees 5909 and 7191 authorized duty-free importation of phosphorus pesticides. That same year, SENASA initiated a program to control organochlorine pesticide residues, including creation of a Pesticide Residues Laboratory, whose monthly output is currently 80-100 samples and is expected to increase, with completion of new facilities, to 200. Text of a pesticides law (18073 of Jan. 20, 1969) is given in full, also several tables of test data.

76-0076. Hom, W.; Risebrough, R. W.; Soutar, A.; Young, D. R. (Bodega Marine Lab., Univ. California, Bodega Bay, CA 94923). **Deposition of DDE and polychlorinated biphenyls in dated sediments of the Santa Barbara Basin.** *Science* 184(4142): 1197-1199; 1974. (16 references)

The deposition of DDE and PCBs in the varved anaerobic sediments of the Santa Barbara Basin in California was studied. The sediment samples (from Core 265) were frozen, freeze-dried, Soxhlet extracted with Nanograde hexane, cleaned up on Florisil columns, and analyzed by electron capture gas-liquid chromatography. The deposition of PCB began in about 1945 and increased rapidly after World War II. Measurable amounts of DDE appeared only in the sediments deposited after 1952. Neither DDE nor PCB showed any indication of a leveling off in the rate of deposition throught 1967. Local sources for most of the DDT compounds in the Santa Barbara Basin sediments were suggested by the high concentrations of these compounds present in the samples. The high concentrations also suggest that a substantial portion of the chlorinated hydrocarbons entering the sea from diverse sources is being deposited in the sediments. The measured deposition rate of DDT compounds in 1967, if typical of other areas in the Southern California Bight, would represent a total deposition of 10 metric tons/yr over an area of 200 sq km.

76-0077. Castro, T. F.; Yoshida, T. (Internatl. Rice Res. Inst., Los Banos, Laguna, Philippines). **Effects of organic matter on the biodegradation of some organochlorine insecticides in submerged soils.** *Soil Sci., Plant Nutr.* 20(4): 363-370; 1974. (11 references)

Very few studies are available on biodegradation of organochlorine insecticides under flooded rice soil conditions, which is the most common agricultural practice in many Asian countries. This report illustrates the effect of organic matter on the rate of biodegradation of some organochlorine insecticides. The results of the study show that all four isomers of BHC as well as endrin, DDT, and heptachlor degraded faster in nonsterilized than in sterilized Casiguran sandy loam. Microbial degradation was responsible for most of the disappearance of each insecticide in flooded soil. DDT and heptachlor biodegraded quickly, usually in one week. The half-lives for DDT and heptachlor were 3 and 3.5 days, resp. The gamma and alpha isomers of BHC degraded in a 2 week period to less than 1 ppm. Beta and delta isomers degraded to the same level in a 3 week period. Endrin was the most persistent, showing slightly more degradation in non-sterilized than in sterilized soil. No significant difference was noted between recovery of DDT when amended with 0.5 and 10% rice straw, glucose, or cellulose, to previously incubated Maahas clay and Casiguran sandy loam under flooded conditions. However, recovery of the 4 isomers of BHC decreased slightly at 0.5% added organic matter due to organic adsorption. Recovery from soil amended with low levels of organic matter, however, falls within the range of the recovery in unamended control soils, indicating that low levels of organic matter do not cause enough adsorption to affect the biological degradation of insecticides to any significant extent. Persistence of DDT was not affected by the addition of organic matter to the soil. Production of DDT proceeded at consistent rates in amended and control soils. Adding organic matter to Casiguran sandy loam did not significantly stimulate degradation of BHC, except for the addition of glucose which inhibited the degradation of all the isomers, probably due to increased fungi population.

76-0078. Wood, A. L.; Davidson, J. M. (Dep. Agron., Oklahoma State Univ., Stillwater, OK 74074). **Fluometuron and water content distributions during infiltration: measured and calculated.** *Soil Sci. Soc. Am. Proc.* 39(5): 820-825; 1975. (20 references)

Laboratory columns of Cobb sand were used to study the movement and distribution of surface applied

1,1-dimethyl -3-(α,α,α- trifluoro- *m*-tolyl) urea (fluometuron) for three infiltration rates and two initial soil-water contents. Fluometuron movement showed little dependence on initial soil-water content for a given infiltration rate. Experimental data indicated that equilibrium existed between the adsorbed and solution phases for all infiltration rates and initial soil water contents studied with the exception of the ponded infiltration into air-dry soil case. A simultaneous numerical solution of the water and solute transport equations described a fluometuron pulse, for large infiltration rates, which lagged behind the experimental data. The agreement between calculated and measured distributions was improved when the infiltration rate was reduced. The shape of the fluometuron pulse was reasonably well described by the mathematical model. (Author abstract by permission)

76-0079. Mingelgrin, H.; Gerstl, Z.; Yaron, B. (Div. Soil Residues Chem., Agric. Res. Organ., Bet Dagan, Israel). **Primiphos ethyl–clay surface interactions.** *Soil Sci. Soc. Am. Proc.* 39(5): 834-837; 1975. (9 references)

Pirimiphos ethyl (PE) losses on Na-kaolinite and Na-bentonite were investigated, and the effect of moisture and temperature on the clay-pesticide interactions determined. The behavior of other organo-phosphorus pesticides, and the mechanisms of the hydrolysis of organophosphorus pesticides catalyzed by clay surfaces. The data suggest that the dominant mode of loss is the hydrolysis of the phosphate ester bond with the pyrimidine ring of pirimiphos ethyl. Hydrolysis occurred at a significant rate on air-dried Na-kaolinite at 23°C and 47°C and on oven-dried as well as air-dried Na-bentonite at 47°C. (Author abstract by permission)

76-0080. Wilson, L. E.; Lavy, T. L. (Dep. Agron., Univ. Nebraska, Lincoln, NB). **Injecting and sampling equipment for studying mobility of pesticides in a soil profile.** *Soil Sci. Soc. Am. Proc.* 39(5): 1009-1011; 1975. (12 references)

The injecting equipment described allows one to conveniently and accurately apply a liquid treatment to an exact location and specific soil depth. The sampling equipment facilitates the precise relocation of the point of injection. By sampling at 2.5-cm vertical intervals, the extent of downward movement can be accurately determined. The equipment was designed to minimize smear and compaction which can occur during sampling of moist soils. (Author abstract by permission)

76-0081. Haque, R.; Ash, N. (Dep. Agr. Chem., Environ. Health Sci. Cent., Oregon State Univ., OR). **Factors affecting the behavior of chemicals in the environment.** *IN: Survival in Toxic Environments.* M.A.Q. Khan and J.P. Bederka, Jr., eds., Academic Press, New York, 1974, p. 357-371. (25 references)

The use of physical-chemical properties in describing the transport, persistence, and mode of action of toxic chemicals such as pesticides in the environment is discussed. Transport of a chemical in the hydrosphere is strongly influenced by the water solubility and heat of solution of the chemical, and the compound's vapor pressure is the primary determinant of its transport into air. Most toxic chemicals come into contact with a surface material when they are released into the environment; the adsorption characteristics of the chemicals then become important in determining the compounds' biological activity, fate, and behavior in the soil. Chemicals in the environment can be degraded by chemical, biological, and/or photochemical decomposition. Chemical decomposition is most common in air and water, whereas biological (microbial) degradation is important in water and soils, and photochemical reactions may take place in air or water. The reaction of environmental chemicals with the macromolecules present in the biota is influenced by factors such as the functional groups present in the compound and their availability and the presence of metal compounds such as lead, cadmium, and mercury.

76-0082. Makhon'ko, K. P. (Inst. Exper. Meteorology, USSR). **III. Khimicheskie zagryazneniya vneshney sredy. Izuchenie rasprostraneniya yadokhimikatov pri avioopylivanii poley.** [**Chemical contamination of the environment. Part III. Study of the spread of pesticides after distribution over fields from aircraft.**] *Trudy Inst. Eksper. Meteorol.* 3(42): 114-121; 1974. (16 references) (Russian)

The dispersion and spread of a 1:1 mixture of DDT and wofatox (methyl parathion) were studied after distribution from aircraft at 5 m altitude at 0.1 m/sec wind velocity before sunrise and after sunset. The pesticide concentration in the air near the aircraft was 56 mg/m^3, with a second maximum at 40 m, and 0.3 mg/m^3 at 750 m distance. The latter value is greater than the calculated one. The particle size distribution of the pesticide aerosol was approaching that of airborne dust with increasing distance from the path of the aircraft. The DDT-to-wofatox ratio in the pesticide aerosol underwent no appreciable change with increasing distance.

76-0083. Pleshakov, V. I.; Serov, V. M. (Kirghiz Sci. Res. Inst. Livestock Farming and Veterinary Medicine, USSR). **Ostatki 2,4-dikhlorfenoksiuksusnoy kisloty v rasteniyakh.** [**2,4-Dichlorophenoxyacetic acid residues in plants.**] *Veterinariya (Moscow)* 7: 90-91; 1975. (Russian)

The residue dynamics of 2,4-D preparations in grass and weeds were studied 3 to 100 days after the treatment of a pasture by spraying. The residues were determined by thin-layer chromatography at a sensitivity limit of 0.1-0.2 μg. After treatment with 2,4-D butyl ester at a rate of 0.4 kg/ha, 2,4-D residues were found in the plants for 45 days. The plant samples contained 2,4-D residues for 100 days after treatment with 3 and 5 kg/ha doses of 2,4-D butyl ester, or with 4.8 and 7 kg/ha doses of 2,4-D amine salt.

76-0084. Smith, A. E.; Cullimore, D. R. (Agr. Canada, Res. Stn., Regina, Saskatchewan, Canada). **Microbiological degradation of the herbicide dicamba in moist soils at different temperatures.** *Weed Res.* 15(1): 59-62; 1975. (8 references)

The persistence of [^{14}C]dicamba (3,6-dichloro -2-methoxy-benzoic acid) at the 2 ppm level was studied in three prairie soils at field capacity moistures and temperatures ranging from -5± 1° to 35 ± 1°C. Following extraction of the soils with aqueous calcium chloride solution a radiochemical analytical procedure was used to monitor the breakdown. In all soils no loss of dicamba was observed at -5 ± 1°C, but breakdown was apparent at temperatures above 5 ± 1°C. On a heavy clay and a silty clay an almost steady relationship between temperature and percentage degradation occurred between 5 ± 1° to 35 ± 1°C. Rate of breakdown was more rapid on the organic silty clay than on heavy clay or sandy loam. Over 80% of the [^{14}C]dicamba was dissipated from the silty clay in 8 days at temperatures above 15 ± 1°C, while 14 days, and temperatures in excess of 20 ± 1°C, were required for loss of similar amounts of the herbicide from the heavy clay and the sandy loam. (Author abstract by permission)

76-0085. Lay, M. M.; Ilnicki, R. D. (Dep. Soils Crops, Rutgers Univ., New Brunswick, NJ). **Effect of soil storage on propanil degradation.** *Weed Res.* 15(1): 63-66; 1975. (8 references)

Sassafras sandy loam soil was subjected to various storage conditions after collection and 3′,4′-dichloropropionanilide (propanil) was used for testing the biodegradation potential of the stored soil. Cleavage of propanil was affected drastically after 5 days' moist storage at 0, 10, 25 or - 15°C and by 5 days' air-drying. In 1 week approximately 90% of the propanil was degraded when fresh soil samples were used. However, 60-80% of residual propanil was found in soil which had been stored under various conditions from 5 to 30 days. Samples air-dried for 10 days were mildly affected as compared with the samples moist-stored at various temperatures, indicating that restricted gas exchange had a detrimental effect on biodegradation in moist-stored samples. These findings show that any biodegradation study should be conducted with fresh soil samples. (Author abstract by permission)

76-0086. Torstensson, N. T. L.; Stark, J.; Goeransson, B. (Agr. Coll., Dep. Microbiol., Uppsala, Sweden). **The effect of repeated applications of 2,4-D and MCPA on their breakdown in soil.** *Weed Res.* 15(3): 159-164; 1975. (19 references)

The effect of repeated applications of 2,4-D and MCPA in a long-term field experiment on their subsequent degradation was investigated. The herbicides had been applied annually since 1954. Comparisons were made with plots treated once and then retreated the following year. Repeated applications of the two herbicides resulted in reduction in degradation time from 10 weeks for 2,4-D and 20 weeks for MCPA after one application to 4 and 7 weeks respectively after 19 years of annual application. In spite of an increased capability of the soil microflora to degrade 2,4-D and MCPA 9 months after a previous treatment, no change in numbers of organisms capable of utilizing the substances as carbon sources was found in treated plots as compared with the control. It is obvious that there is a cross adaptation between 2,4-D and MCPA. It seems most likely that two different 'enrichment' floras have been induced, each capable of decomposing both herbicides, but with different efficiencies. (Author abstract by permission)

76-0087. Fryer, J. D.; Hance, R. J.; Ludwig, J. W. (Agric. Res. Council, Res. Organ., Yarnton, Oxford, England). **Long-term persistence of paraquat in a sandy loam soil.** *Weed Res.* 15(3): 189-194; 1975. (15 references)

A long-term field experiment was established in 1967 to measure the persistence in soil of paraquat dichloride applied annually either as a single dose of 4.48 kg/ha or in four separate doses of 1.12 kg/ha. From 1969 the treatments were split so that the herbicide was applied (a) to the soil surface; (b) to living vegetation. From 1970 to 1972 inclusive, half of each plot receiving four applications per year was rotary cultivated shortly after each spraying to study whether incorporation influenced persistence. Analysis of soil samples taken to a depth of 36 cm in 1971 and 1973 showed that essentially all the applied paraquat was still present. Most of the paraquat was found in the upper 5 cm layer but significant amounts had reached the 25-36 cm layer. In a supplementary laboratory experiment soil taken from the plots and from two other fields was incubated with paraquat at concentrations equivalent to ca. 50, 100 and 150% of the 'strong adsorption capacity'. The reduction in paraquat extracted by saturated NH_4Cl ranged from 10 to 35% over a period of 17 weeks showed that the microflora of these soils were capable of degrading paraquat slowly if at all. It is concluded that paraquat may be broken down only slowly if at all in the soil under field conditions. (Author abstract by permission)

76-0088. Sprankle, P.; Meggitt, W. F.; Penner, D. (Monsanto Co., St. Louis, MO 63166). **Rapid inactivation of glyphosate in the soil.** *Weed Sci.* 23(3): 224-228; 1975. (4 references)

In greenhouse studies, soil applications of ^{14}C-methyl-labeled glyphosate [*N*-(phosphonomethyl)glycine] were not readily absorbed by corn (*Zea mays* L. 'Michigan 400') and soybean [*Glycine max* (L.) Merr. 'Hark']. However, glyphosate available to plants in sand culture was absorbed. Wheat (*Triticum aestivum* L. 'Avon'), a sensitive bioassay plant, was used to detect the herbicide. Clay loam and muck soil rapidly inactivated 56 kg/ha of glyphosate. Autoclaving of soil did not prevent the inactivation of glyphosate. In a sandy clay loam soil, application of 56 kg/ha of glyphosate decreased plant growth with increasing pH. Additions of 98 or 196 kg/ha of phosphate to the soil decreased glyphosate inactivation in the soil. It is postulated that initial inactivation of glyphosate in soil is by reversible adsorption to clay and organic matter through the phosphonic acid moiety. (Author abstract by permission)

76-0089. Thielemann, H.; Grahneis, H.; Haase, H. H. (Lehrstuhl Allgemeine und Kommunale Hygiene, Martin-Luther-Universitaet, 402 Halle, Franckeplatz 1, Haus 36, DDR). **Untersuchungen zur Frage der Kontamination von Humanmilch mit DDT im Stadtgebiet von Halle (Saale).** [Studies concerning contamination

of human milk with DDT within the city limits of Halle (Saale).] *Z. Gesamte Hyg. Ihre Grenzgeb.* 21(9):685-687; 1975. (16 references) (German)

One hundred eighty-four individual human milk samples collected in the summer of 1973 in the Halle/Saale area of East Germany were analyzed for DDT residues by thin-layer chromatography after alkaline hydrolysis. The detection limits were 0.05 ppm for *o,p'*-DDT, 0.01 ppm for *p,p'*-DDT, and 0.01-0.05 ppm for *p,p'*-DDE. No DDT was detected in 11 samples, while the total DDT (DDT+DDE) levels were 0.07 ppm in 39 samples, 0.13 ppm in 44 samples, 0.17 ppm in 20 samples, 0.25 ppm in 43 samples, 0.34 ppm in 7 samples, 0.5 ppm in 16 samples, 1.25 ppm in 2 samples, and 5 ppm in one sample. The total DDT content averaged 0.23 ppm for all samples. This average shows a decrease from previous years as a result of the restricted use of DDT in the agriculture.

76-0090. Maier-Bode, H. (Pharmakol. Inst. Univ. Bonn, Bonn, Germany). **Rueckstandsfragen in der Herbologie.** [**Residue problems in weed control.**] *Z. Pflanzenkr. Pflanzensch.* 82(5): 303-315; 1975. (41 references) (German)

Problems of herbicide residues in foodstuffs of vegetable origin, aquatic organisms, and drinking water are discussed with reference to the Decree on Maximum Allowable Herbicide Concentration in Foodstuffs of Vegetable Origin, as amended in December 1972. The tolerated residues of 49 out of 89 herbicides have been fixed in West Germany at the 0.01 or 1 ppm level, while zero tolerance is required for amitrole and paraquat (equaling 0.01 ppm for amitrole and 0.05 ppm for paraquat). These tolerance limits are not set too low for practical use. In addition, many herbicides have very low toxicity. Herbicide residues do not usually accumulate in animals. Very small amounts of 2,4-D (below 0.1 ppm) can be traced in cow's milk. While herbicide residues were found in fish after waterweed treatment, these residues decompose rapidly. Groundwater contamination hazards after the application of 2,4,5-T are practially negligible. The decree on the maximum allowable residue levels should be extended to foodstuffs of animal origin, animal feed, and possibly to drinking water, and toxic metabolites of herbicides should also be considered.

76-0091. Schoenhard, G.; Koenig, W. (Inst. Nichtparasit. Pflanzenkr., Biol. Bundesanst., D-100 Berlin 33, Germany). **Arsen-Gehalte und Wirkungen in Boeden und Pflanzen.** [**Arsenic—contents and effects in soils and plants.**] *Z. Pflanzenkr. Pflanzensch.* 82(5): 329-336; 1975. (48 references) (German)

Results of arsenic concentration measurements in native and arsenic-treated soils, and in fruits with and without treatment with arsenic-containing pesticides are reviewed. The background concentration of arsenic in the soil lies at around 5 ppm, while levels of up to 124.4 ppm were measured in orchard soils after prolonged use of arsenicals. The background concentrations of arsenic in untreated fruits and vegetables are between 0.01 and 0.1 ppm. After treatment with arsenic-containing pesticides, the arsenic levels found were 0.17-2.58 ppm in apples, 0.01-0.05 ppm in strawberries, 0.17-1.0 ppm in potatoes, 0.37-1.9 ppm in tobacco, 0.16 ppm in rice, 0.1 ppm in peppers and corn, 0.01 ppm in tomatoes, 0.04 ppm in spinach, 0.03 ppm in cucumbers, 0.08 ppm in soybean oil, 0.13 ppm in cottonseed oil, and 0.9 ppm in cottonseed meal.

76-0092. Poschenrieder, G.; Wallnoefer, P.; Beck, T. (Bayer. Landesanst. Bodenkultur Pflanzenbau, Munich, Germany). **Phenylamid- und Carbamat-Interaktion in Boeden.** [**Phenylamide and carbamate interactions in soils.**] *Z. Pflanzenkr. Pflanzensch.* 82(6/7): 398-405; 1975. (14 references) (German)

The influence of aldicarb, carbaryl, propoxur, parathion, monuron, thiram, and diallate on the persistence and metabolism of ^{14}C-ureido-labeled linuron in the soil was studied in model experiments. Linuron in a dose of 2.5 ppm was introduced into the soil simultaneously with one of these pesticides in concentrations of 0.0001, 0.00005, 0.00001, 0.000002, and 0.000001 mol/1,000 g of soil. All pesticides inhibited the metabolism of linuron, as determined from the ^{14}C-labeled carbon dioxide formation, to varying degrees, which was due to the competitive inhibition by these substances of the microorganisms and enzymes, such as arylacylamidases, which are responsible for the degradation of linuron in the soil.

76-0093. Wendel, K. (A. von Humboldt-Haus, Univ. Essen, Essen, Germany). **Rhizosphaerenorganismen unter dem Einfluss pestizider Umwelt-Belastungen. I. Ein Beitrag zur Frage des Fungizidnachweises (TMTD** = Tetramethylthiuramdisulfid) in Boeden nach Modell-Versuchen. [**Rhizosphere organisms under the influence of environmental exposure. I. A contribution to the problem of fungicide (TMTD** = tetramethyl thiuram disulfide) identification in soils after model experiments.] *Zbl. Bakt. Hyg., I. Abt. Orig. Reihe A* 228(1-2): 141-153; 1974. (42 references) (Russian)

The influence of TMTD (thiram) on rhizosphere microorganisms was studied in model soils by means of the *Aspergillus niger* inhibition test. After a slight but progressive reduction of the fungicidal activity in soils with normal humus content during the first 3 months of the experiment, a renewed increase in the fungicidal activity was observed, which was due to the fungicidal properties of the TMTD metabolites. The fungicidal activity remained nearly constant in sandy soil during the 6-month experiment, which indicates that the metabolism of TMTD is facilitated by humus.

See also **76-0011** **76-0027** **76-0075** **76-0179** **76-0193**

76-0013 **76-0067** **76-0161** **76-0180** **76-0259**

76-0094. Reigart, J. R.; Brueggeman, J. L.; Keil, J. E. (Medical Univ. South Carolina, SC 29401). **Sodium fluoroacetate poisoning.** *Am. J. Dis. Child.* 129(10): 1224-1226; 1975. (11 references)

An 8 month old girl was found chewing on a black-dyed bait cup which had been placed 10 months earlier behind the refrigerator by a licensed pest control operator. She was given large quantities of milk and induced to vomit by manual gagging. Emesis was again induced by her physician within 30 minutes using syrup of ipecac. Over the next few hours anxiousness and agitation appeared in the child who was then flown to the Medical University of South Carolina where she had been undergoing followup since birth for a ventricular septal defect which appeared to be closing. She had been treated the preceding week with erythromycin for otitis media. On admission she was alert, active, and slightly irritable. No arrhythmia was noted. Neurological and physical examinations were normal. Complete blood count, lumbar puncture, and serum chemical analyses were normal, except for a mild elevation in blood urea nitrogen to 22 mg/100 ml. An electrocardiogram showed a sinus tachycardia at 160 beats/min with slight peaking of T waves. A normal red cell count and normal cholinesterase level were reported. Plasma chlorinated hydrocarbon pesticide levels were not elevated. No arsenic was detected in the blood. Cardiac monitoring was started on admission. Except for two episodes of vomiting she remained asymptomatic until 20 hr after ingestion when she had a generalized seizure of one minute's duration for which phenobarbital was administered. In the 12-hr period following this seizure, three further such episodes were experienced. During the interictal period she was quite drowsy but easily arousable with no localizing neurological signs. After 12 hr no further seizures occurred. Four days later she was discharged on phenobarbital therapy. At followup two weeks later no change in her behavior or intellectual or motor performance was obserbed. In following up the use of sodium fluoroacetate, the chemical was placed behind the refrigerator by a pest control operator who confirmed his knowledge of what material he was using. In fact, he had used it in several homes. He was not licensed in this state, had crossed state lines from the state in which he was licensed, did not have a permit to use sodium fluoroacetate, and had obtained this material illegally. His license was revoked. The following therapy is advised in such cases: i.m. doses of monoacetin, 0.1 to 0.5 mg/kg/hr; continuous cardiac monitoring; seizure control with anticonvulsants; avoid calcium, potassium, sodium chloride, bicarbonate, or acetate infusions; replace fluid cautiously; avoid cardiac glycosides.

76-0095. Maggs, F. A. P.; Smith, M. E. (Chem. Defence Establ., Porton Down, Salisbury, Wiltshire, England). **The use and regeneration of Type-O canisters for protection against methyl bromide.** *Ann. Occup. Hyg.* 18(2): 111-119; 1975. (10 references)

Workers using methyl bromide, a pesticide employed commercially for soil sterilization, must use respiratory protection. Such protection is currently afforded by the industrial respirators (O-Type). There is currently no method to determine the usefulness of a given canister. There is a safe, but arbitrary replacement system in effect, but this results in the canisters not being used to the fullest extent. The study reports a program involving non-destructive testing of new and partially-used canisters using methyl bromide as the test agent; measurement of the protective capacity of new Type-O canisters under British Standards Institution test conditions; and regeneration experiments. Findings reveal that a new Type-O canister or a regenerated one should only be used continuously for 30 min before it is discarded, whatever the ambient concentration of methyl bromide. From the limited data available it appears that the maximum safe initial dose should not exceed 3 g if subsequent desorption is to be limited to a concentration below the TLV. Such a dose would arise for example from an exposure of 4 min to a 1% v/v concentration or 40 min to a 0.1% concentration. Relatively mild treatment appeared adequate for regeneration. It is important that the direction of air flow should be in the reverse of that used in respiratory protection so that the charcoal nearest to the normal exit spigot will be thus clean. It is advised that a method of estimating the concentration of methyl bromide should be available to monitor the effluent air from regenerated canisters. The re-use of Type-O canisters after initial use against dichloromethane or chloromethane cannot be recommeded.

76-0096. Rodnitzky, R. L.; Levin, H. S.; Mick, D. L. (Dep. Neurol., Univ. Hosp., Iowa City, IA 52242). **Occupational exposure to organophosphate pesticides.** *Arch. Environ. Health* 30(2): 98-103; 1975. (28 references)

Acute organophosphate intoxication in man is well known to result in substantial central nervous system dysfunction. To test the hypothesis that similar neurobehavioral abnormalities might be present in mild degree in workers chronically exposed to organophosphate pesticides, 23 such subjects were tested for abnormalities in memory, signal processing, vigilance, language, and proprioceptive feedback performance. The performance of the exposed workers was not deficient in any of the five measures assessed when compared with the performance of a control group matched for age and educational background. Plasma and red blood cell cholinesterase levels were found to be in the normal range in both exposed and control groups, although plasma levels of exposed subjects were depressed somewhat below control values. Relative resistance of higher nervous system functions to mild chronic organophosphate exposure is suggested by these results. (Author abstract by permission)

76-0097. Rustam, H.; Von Burg, R.; Amin-Zaki, L.; El Hassani, S. (Ramapo Coll., Mahwah, NJ 07430). **Evidence for a neuromuscular disorder in methylmercury poisoning.** *Arch. Environ. Health* 30(4): 190-195; 1975. (23 references)

Data suggestive of a neuromuscular disorder responsive to neostigmine was uncovered in the course of

electrophysiological testing of Iraqi patients poisoned by methylmercury. Subsequent neostigmine therapy produced a remarkable clinical improvement of the patients. Placebo substitution resulted in a substantial loss of testable strength that was restored when drug therapy was resumed. (Author abstract by permission)

76-0098. Prouty, R. M.; Peterson, J. E.; Locke, L. N.; Mulhern, B. M. (U.S. Fish and Wildlife Service, Patuxent Wildlife Res. Cent., Laurel, MD. 20811). **DDD poisoning in a loon and the identification of the hydroxylated form of DDD.** *Bull. Environ. Contam. Toxicol.* 14(4): 385-388; 1975. (7 references)

A common loon (*Gavia immer*) was found in a soybean field in Madison County, Mississippi, in December of 1973. The bird died shortly after it was found. The loon was a subadult female weighing 4 lb with fairly well-developed pectoral muscles but without s.c., abdominal, and coronary fat. Small ring- and droplet-like inclusions were noted in the liver cells similar to those reported in birds experimentally poisoned by DDT or other agents. Based on the autopsy findings and the high level of DDD (200 ppm) in the brain, the cause of death was presumed to be DDD (TDE) poisoning. It is noted that the poisoning of this loon occurred 1.5 yr after the moratorium on DDT and DDD usage. An unknown, but suspected hydroxylated form of DDD, was also recovered from the bird. This is the first time, apparently, that this metabolite has been reported in an environmental sample.

76-0099. Anonymous. **Effects of trace metals on sea lions probed.** *Chem. Eng. News* 53(46): 34; 1975.

Current studies on the effects of ocean pollutants include investigations into premature pupping in sea lions and the lingering effects of DDT in ocean organisms. Premature pupping in California sea lions may be linked to pollution of the coastal waters with mercury, selenium, cadmium, PCBs, and perhaps certain viruses. The problem is probably caused by a combination of factors rather than a single factor. Although the DDT levels in the waters along the southern California coast have gradually declined over the past 5 yr, this insecticide will be major pollutant in the area for years to come. While DDT levels in marine animals such as crabs that live on the bottom have not declined, DDT concentrations in the Dover sole have remained above the federal limit (5 ppm) since 1971, and the contaminated fish are showing an increased incidence of fin rot. Because the ocean sediments off the Los Angeles sewage outfall contain large quantities of DDT, the potential hazard associated with eating contaminated bottom fish will probably not decline in the near future.

76-0100. Von Butenandt, I.; Mantel, K.; Fendel, H. (Univ.-Kinderklin., Munich, Germany). **Intoxication with paraquat in 2 children.** *Clin. Med.* 82(9): 16; 1975.

Two children were treated after ingestion of a herbicide containing paraquat. One of the children died of pulmonary fibrosis, a typical manifestation of paraquat poisoning. Since even very small amounts of this chemical may be fatal and since a specific antidote does not exist, immediate and effective elimination of the poison is imperative. Even if questionable or minimal amounts have been ingested, gastric lavage must be undertaken immediately and potent laxatives must be administered for several days. Forced diuresis should be started simultaneously and continued over an even longer period of time. Prompt and effective therapeutic measures constitute the only chance for saving the patient.

76-0101. Sim, V. M. (Edgewood Arsenal, MD). **Anticholinesterase poisoning.** *Clin. Med.* 82(9): 18; 1975.

Rural physicians are becoming increasingly aware of the dangers presented by organophosphorus anticholinesterase products. Oral ingestion and absorption through the skin are followed by symptoms such as gastrointestinal upset and pulmonary and nervous system disorders. Inhalation leads to headache, giddiness, nervousness, photophobia, blurred vision, weakness, nausea, chest pains, and abdominal cramping. Individuals unwittingly exposed to these chemicals may complain only of weakness, loss of appetite, insomnia, and diarrhea, and blood cholinesterase levels may be almost undetectable. If exposure continues, severe signs and symptoms of cholinesterase poisoning may appear suddenly. General principles of management include: decontamination, oxygenation, and the administration of atropine (2-4 mg, i.v.) and oximes. Diazepam may be given if atropine fails to control convulsions. Patients must be kept in bed and not allowed to smoke. The aftereffects of cholinesterase poisoning may persist for several months.

76-0102. Gehlbach, S. H.; Williams, W. A.; Woodall, J. S.; Freeman, J. I. (North Carolina Dep. Human Resources, Raleigh, NC 27602). **Pesticides and human health: epidemiologic approach.** *Clin. Med.* 82(9): 18; 1975.

Pesticides are responsible for many nonfatal poisonings and deaths in the U.S. Between 1970 and 1972, 381 instances of pesticide exposure were reported in North Carolina; almost 50% of these patients were children. Of the 381 patients, 155 were symptomatic and 29 died. The risk of poisoning in a community depends on usage patterns and the prevalence of pesticides in the area. In 1969-70, 245 pesticide-using farms in one North Carolina county were surveyed. Sixty-eight percent of the farmers said they never wore any kind of protective clothing or face mask when applying the pesticides and 70% discarded used containers in the woods or fields. The North Carolina Pesticide Program publishes monthly newsletters and poison control notes, and charts describing common pesticides, signs of poisoning, and treatment methods have been distributed to 158 emergency rooms throughout the state. There remains a need for continuing education in the safe use of farm chemicals.

76-0103. Kraemer, M.; Giebelmann, R. (Inst. Gerichtl. Med. Krim., Ernst-Moritz-Arndt-Universitaet, 22 Greifswald, Germany). **Toedliche Intoxikation mit Zin-**

khexafluosilikat. [Fatal intoxication with zinc hexafluorosilicate.] *Dtsch. Gesundheitsw.* 30(43): 2057-2059; 1975. (13 references) (German)

A fatal poisoning with zinc hexafluorosilicate in a 34-year-old man is reported. The victim had drunk half a glass of Fluat-Vogel solution with suicidal intent. Emesis, tetanic convulsions 3.5 hr after poisoning, and death due to cardiac and respiratory failure 4.5 hr after poisoning were observed. Hyperemia, stasis, and edema of the internal organs were found on autopsy. Bleeding of the gastric mucosa, as well as subpericardial, subpleural, and subperitoneal hemorrhages were observed. A large amount of zinc hexafluorosilicate was found in the gastric contents and in the blood by atomic absorption photometry.

76-0104. Carson, D. J. L.; Carson, E. D. (Belfast, North Ireland). **The increasing use of paraquat as a suicidal agent.** *Forensic Sci.* 5(2): 114; 1975.

Paraquat, an effective weedkiller, is safe if used as intended. Misuse of this chemical, however, has resulted in numerous deaths. Significant amounts taken orally are usually fatal and there is no effective antidote. In Ireland, deaths from paraquat poisoning have been proportionately higher than elsewhere. An analysis is made of 24 fatal and 6 nonfatal poisonings occurring in Northern Ireland during the period 1967-1975. The discussion includes history, clinical features, length of survival, and pathological findings. Toxicological analyses were performed on samples taken during life, and on body fluids and tissues obtained at autopsy. The data shows progressive but slow fall-off in paraquat recovery after ingestion, with detectable levels still present at 23 days after ingestion. During the earlier part of the time period studied, these poisonings usually resulted accidentally, primarily via storage of concentrated liquid in unmarked containers. More recently, the poisonings have resulted from suicide attempts. Of 13 fatal paraquat cases occurring since the beginning of 1973, 11 were deliberate.

76-0105. Thiess, A. M. (Aerztliche Abteilung, BASF Aktiengesellschaft, Ludwigshafen, Germany). **Gesundheitsschaedigende Staeube in der chemischen Industrie. [Hazardous dusts in the chemical industry.]** *Fortschr. Med.* 93(5): 191-192,218-219; 1975. (German)

The problem of harmful and toxic dust emissions and the necessary preventive measures in inorganic and organic chemistry and in the production of fertilizers, plastics, dyes, detergents, drugs, and pesticides are outlined. Particularly strict precautionary measures are to be taken in the production and application of pesticides. Production should always be in closed systems. Satisfactory ventilation is necessary in the production shops, and air sample analyses should be performed at regular intervals. The personnel should be provided with protective clothing and protective masks, and should undergo regular medical check-ups.

76-0106. Brooker, M. P.; Edwards, R. W. (Univ. Wales Inst. Sci. Technol., Cathays Park, Cardiff, Wales). **Effects of the herbicide paraquat on the ecology of a reservoir. III. Fauna and general discussion.** *Freshwater Biol.* 4(4): 311-335; 1974. (43 references)

This paper is the last of a series describing major ecological effects of paraquat used for weed control in a fishing reservior at Barry in South Wales. Toxicity studies indicated that changes in the fauna were likely to be indirect effects caused by the death and destruction of angiosperms. In general, invertebrates living amongst the emergent vegetation in the margins of the reservoir and on the sediments were unaffected. However, the density of the benthic ostracold *Cypridopsis vidua* increased rapidly after the death of angiosperms. Those planktonic invertebrates which were generally closely associated with the macrophytes were eliminated or survived at lower densities. Many invertebrates which were intimately associated with the angiosperms were lost completely or colonized the replacement growth of *Chara globularis* at reduced densities. A few species colonizing *Chara* were able to establish densities comparable with those found on the angiosperms in the preherbicide period. In some cases the time of peak density was delayed. Fish gut analyses showed that there was a change in the diet of the eel following the death of the angiosperms. This was largely a reflection of the loss, or reduction in density, of many invertebrates associated with the angiosperms.

76-0107. Smetanin, N. I.; Mikhaylova, G. G. (Ryazan Med. Inst., USSR). **O trebovaniyakh k ventilyatsii na skladaky yadokhimikatov. [Ventilation requirements in toxic-chemical warehouses.]** *Gig. Primen. Toksikol. Pestits. Klin. Otravlenii* 8: 435-443; 1970. (Russian)

Pesticide concentration measurements were conducted at different pesticide warehouses in the USSR to determine the ventilation requirements in such warehouses. Without forced ventilation, the DDT, BHC, methaphos (methyl parathion), methylmercaptophos, trichlorfon, and granosan concentrations in the air were in the respective ranges of 0.04-0.396 mg/m^3; 0.027-0.792 mg/m^3; 0.05-0.322 mg/m^3; 0.036-0.178 mg/m^3; 0.06-1.391 mg/m^3; and 0.019-0.028 mg/m^3. The maximum allowable concentrations in the air were exceeded in 30 to 83% of all air samples. The mercury vapor concentration in the air at 200 to 400 m distance from the warehouse was 0.006 mg/m^3. The necessary air exchange number was calculated to be between 11 and 26/hr to reduce the pesticide concentrations in the air to the respective MAC values. Also, the ventilation system should be in operation for at least 2 hr before the beginning of the workday. The pesticide concentrations in the air can be substantially reduced by replacing soft packaging by hard, e.g., metal containers. The potentiating effect of high temperature, and the possible synergism with other pesticides in the air should also be taken into account when calculating the required air exchange rate for pesticide warehouses.

76-0108. Perelygin, V. M. (A. N. Sysin Inst. General and Communal Hyg., Acad. Med. Sci. USSR, Moscow, USSR). **Teoreticheskie osnovy gigienicheskogo normirovaniya vrednykh veshchestv v pochve. [The theoretical**

basis of hygienic standardization of noxious substances in the soil.] *Gig. Sanit.* 1: 29-33; 1975. (6 references) (Russian)

The theoretical basis and future requirements concerning the hygienic standardization of harmful chemical substances, including pesticides, in soil are discussed. In general, the maximum allowable concentration of harmful substances in the soil should be determined to be such that the respective maximum allowable levels established for air, water, and plants will not be exceeded. The criteria of the hygienic standardization in the soil are the effect on the biological activity of the soil, the effect on nitrification processes, the residue levels in plants and crops with respect to the maximum allowable residues levels, the migration of the substances with underground waters, and the maximum allowable concentration in drinking water with respect to the average daily intake. Hygienic standardization is at present most important for substances which are highly stable in the soil, and for which there are already similar standards in air, water, and plants.

76-0109. Mironenko, N. N. (Saratov Med. Inst., USSR). **Eksperimental'nye issledovaniya bezvrednykh urovney gerbitsida linurona i dikhlorfeniloksimocheviny v vode vodemov.** [**An experimental investigation of the safe levels of the herbicides linuron and dichlorophenylhydroxyurea in water bodies.**] *Gig. Sanit.* 7: 46-49; 1975. (7 references) (Russian)

Complex hygienic investigations of linuron and dichlorophenylhydroxyurea were carried out for the hygienic substantiation of safe levels of these substances in water bodies. Regarding the organoleptic properties of water, the threshold concentration of linuron was determined to be 3.3 mg/liter, and that of dichlorophenylhydroxyurea was found to be 7.8 mg/l. Judging from the LD50 levels in mice, rats, and rabbits, linuron and dichlorophenylhydroxyurea have low toxicity and weak cumulative effect. The ineffective levels of linuron and dichlorophenylhydroxyurea were found to be 1 mg/l and 0.8 mg/l in chronic poisoning tests. On the basis of the experimental results, the maximum allowable concentrations of linuron and dichlorophenylhydroxyurea are recommended to be set at 1 mg/l and 0.8 mg/l in water bodies, with the hygienic and toxicological effects constituting the limiting factor.

76-0110. Kaskevich, L. M. (Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastics, Kiev, USSR). **Primenenie reogepatografii v diagnostike toksiko-khimicheskikh porazheniy pecheni u lits, rabotayuschikh s tetrametiltiuramdisul'fidom.** [**Rheohepatography in the diagnosis of toxicochemical lesions of the liver in persons dealing with tetramethylthiuram disulfide (TMTD).**] *Gig. Tr. Prof. Zabol.* 6: 16-19; 1975. (11 references) (Russian)

General clinical and rheohepatographic findings are reported in 42 subjects (20 men and 22 women) exposed to TMTD (thiram) in agriculture. Thirty subjects were 28-45 years of age; 12 were 45-50. They had been exposed to TMTD occupationally for 3 to 10 yr. Moderate hypoalbuminemia, reduced pseudocholinesterase activity, increased urobilinuria, and moderately increased pyruvate transaminase activity were the most common clinical findings. Rheohepatography revealed disturbances in the intrahepatic blood filling in 32 of the 42 subjects. The rheohepatographic changes were characterized mainly by a reduced rheographic index, and reduced amplitude-frequency index. These changes were most pronounced in subjects with clinically manifest toxic hepatitis and hepatocholecystitis. A reduction of the systolic-diastolic ratio was observed only in subjects with a clinically pathological hepatobiliary system. Rheohepatographic changes indicative of pathological changes in the liver were also found in subjects without clinically or biochemically pathological findings, which indicates the value of rheohepatography in the early diagnosis of TMTD-induced hepatic changes.

76-0111. Mayersdorf, A.; Israeli, R. (Univ. Negev, Beer-Sheva, Israel). [**EEG (electroencephalogram) changes due to exposure to organochlorine insecticides.**] *Harefuah* 85(7): 307-310; 1973. (20 references) (Hebrew)

Seventy-three workers exposed to organochlorine insecticides were examined. The EEG (electroencephalogram) was recorded as a routine examination without prior notice to the workers. Results of the study showed 16 (21.9%) of those examined to have pathological EEG changes. A direct relationship between duration of exposure and severity of the changes was not proven. The most severe changes were found among the group of workers exposed for 1-2 yr. These EEG changes were expressed mainly as sharp, scattered waves of varying frequency. None of the workers showed neurological abnormalities or attacks of clinical convulsions. The observations were in accordance with previously published data. Changes resulting from exposure to organochlorine insecticides are most likely due to destruction of the metabolizing ammonia system in the brain (as demonstrated in animal studies). Results suggest that EEG changes are caused by exposure to excessive concentrations of organochlorine insecticides. However, it has not been conclusively proven that the observed pathological changes necessitate the removal of workers from this exposure for long periods.

76-0112. Anderson, M. D.; Rosenkranz, H. S. (Henry Ford Hosp., 2799 West Grand Boulevard, Detroit, MI 48202). **Greenhouse fungicide—environmental carcinogen?** *Henry Ford Hosp. Med. J.* 22(1): 35-40; 1974. (19 references)

Eight pesticides, isotox (BHC), malathion, morsodren (methylmercury dicyandiamide), fulex, formula Ch-19, captan, parzate (nabam), and tetrachlor, were recovered from the greenhouse of a 72 yr old male who had worked all his adult life commercially growing orchids and carnations. Faltering speech had developed in the last 5 yr. His hospitalization was caused by an epileptic seizure. A tumor strain was revealed by cerebral angiography to be located in the left temporal lobe. Craniotomy revealed a grade III malignant astrocytoma which was partly excised. This patient, and others working with pesticides which

were sprayed on their targets in an enclosed environment, had prior episodes of documented pesticide intoxication. This suggested that these aerosols may be carcinogenic. A simple screening method was used to test the 8 pesticides. In this method a bacterial mutant, deficient in its ability of repair DNA, is used to detect genetic damage caused by the carcinogens. The test is based on the finding that cells exposed to agents which modify their DNA tend to protect themselves by excising the altered DNA portion and re-synthesizing the correct sequence of nucleotides in the double helix. Three of the 8 pesticides tested preferentially inhibited *E. coli* growth, morsodren, captan, and parzate. In an effect to investigate the type of damage, mammalian DNA was exposed to these 3 mutagenic pesticides in vitro and analyzed. The normal DNA sedimentation pattern was altered by 2 of the 3. Captan was found to irreversibly denature DNA. Ascending paper chromatography was used to further study the mode of action of captan.

76-0113. Okonek, S. (Center for Detoxification and Poison Information, Second Med. Univ. Clin., Mayance, Germany). **Aktuelle Gesichtspunkte zur Intoxikation durch Alkylphosphate. Biochemische Befunde, Symptomatik und Therapie. [Current problems of poisonings with alkylphosphates. Biochemical findings, symptoms, and therapy.]** *Internist (Berlin)* 16(3): 123-130; 1975. (88 references) (German)

The mechanisms of action and effects of alkylphosphate, and therapeutic possibilities in alkylphosphate poisonings are reviewed. Muscarinic and nicotinic syndromes, coma, hypoxia, respiratory and metabolic acidosis, changes in blood clotting, increased serum amino acid levels, hypothermia, disturbances in the liver function, and cardiac complications are generally observed in acute poisoning. Perspiration, hypersalivation, headache, vertigo, nausea, and possibly visual troubles characterize mild poisonings with acetylcholinesterase activities between 40 and 60% of the normal level. Poisonings of medium seriousness, with acetylcholinesterase activities betwen 20 and 40% of the normal level, are characterized by muscular debility, chest pressure, and muscular fasciculation. Severe cases display dyspnea and generalized respiratory disturbances. Atropine, oximes (especially obidoxime), fresh serum cholinesterase, thorough gastric lavage, and forced diarrhea are indicated for the therapy of acute poisoning.

76-0114. Peavy, G. M. (Macy, Thomas, and Hauser Vet. Hosp., Whittier, CA 90602). **The use of diazepam and methocarbamol in the treatment of toxaphene poisoning in a Bengal tiger.** *J. Am. Vet. Med. Assoc.* 167(7): 577-678; 1975. (15 references)

A 12-year-old female Bengal tiger was presented with clinical signs of acute chlorinated hydrocarbon poisoning and a history of recent consumption of food contaminated with toxaphene. Hyperreflexia and periodic convulsions were controlled by initial intramuscular injections of 30 mg diazepam and 2 g methocarbamol, followed at 6-hour intervals with intramuscular injections of 30 mg diazepam each, for 2 additional treatments. Following the initial treatment, hyperreflexia and convulsions did not recur. (Author abstract by permission)

76-0115. Bell, T. G.; Farrell, R. K.; Padgett, G. A.; Leendertsen, L. W. (Dep. Vet. Pathol., Coll. Vet. Med., Washington State Univ., Pullman, WA 99163). **Ataxia, depression, and dermatitis associated with the use of dichlorvos-impregnated collars in the laboratory cat.** *J. Am. Vet. Med. Assoc.* 167(7): 579-586; 1975. (44 references)

Ataxia and depression developed in 21 of 50 (42%) laboratory cats wearing flea collars impregnated with 2,2-dichlorovinyl dimethyl phosphate (dichlorvos or DDVP) in a warm dry environment. Five (10%) of the cats died. Whole blood cholinesterase (ChE) activity was significantly ($P < 0.001$) reduced in all cats and cervical dermatitis occurred in 37 (74%) of them. (Author abstract by permission)

76-0116. Bigler, W. J.; Jenkins, J. H.; Cumbie, P. M.; Hoff, G. L.; Prather, E. C. (Florida Div. Health, Dep. Health Rehab. Serv., Jacksonville, FL 32201). **Wildlife and environmental health: raccoons as indicators of zoonoses and pollutants in southeastern United States.** *J. Am. Vet. Med. Assoc.* 167(7): 592-597; 1975. (54 references)

Inasmuch as terrestrial fauna are an integral part of our natural environment and are directly exposed to disease and pollutants, it follows that certain wild populations could serve to detect subtle alterations within ecosystems. A collection of studies on raccoons is presented to stimulate other researchers to develop the potential of our wildlife resources as monitors of environmental health. Raccoons have been used as serologic sentinels for St. Louis encephalitis and Venezuelan equine encephalomyelitis. Studies suggest that the raccoon may be used as an indicator of leptospirosis, tularemia, and some enteric bacteria and viruses. Baseline surveys have defined residue levels of organochlorine and organophosphate compounds and body burdens of mercury, cesium-137, and strontium-90. Physiologic responses, parasite burdens, and reproductive processes are also considered as measures that may reflect pertinent information about environmental health. (Author abstract by permission)

76-0117. Spain, A. V. (Dep. Forestry, Sch. Gen. Studies, Australian Natl. Univ., Canberra, Australia). **The effects of carbaryl and DDT on the litter fauna of a Corsican pine (*Pinus nigra* var. *maritima*) forest: a multivariate comparison.** *J. Appl. Ecol.* 11(2): 467-481; 1974. (22 references)

The effects of two levels of the insecticides carbaryl (0.11 and 1.13 g/m²) and DDT (0.56 and 5.60 g/m²) on the litter fauna of a closed canopy stand of *Pinus nigra* var. *maritima* were assessed. These particular insecticides were chosen to contrast the effects of the persistent chlorinated hydrocarbon with the more transient carbamate. Recovery processes of fauna, insects, and mites in the litter were followed for 10 months after treatment. A re-

version to the status of the untreated population was not recorded for any of the insecticide-treated plots. Degradation of an insecticide is a lengthy process in soils rich in organic matter.

76-0118. Amor, R. L.; Twentyman, J. D. (Keith Turnbull Res. Stn., Frankston, Victoria, Australia). **Objectives of, and objections to, Australian noxious weed legislations.** *J. Aust. Inst. Agric. Sci.* 39-40(3): 194-203; 1974. (43 references)

A framework is provided for an objective discussion concerning noxious weeds so that decisions to label certain plants in this manner can be based more on biological and technological facts and less on local politics. Legislation in Australia and other countries is reviewed. A discussion of the characteristics of proclaimed weeds is given and the political aspects of weed legislation considered. It is concluded that the failture of weed legislation to achieve more positive results suggests that changes are needed. It is considered important for the government to establish a goal before making a decision to contain a certain weed. The goal must be realistic. Such decisions should be made by people with a sound knowledge of land managment and an appreciation of ecological principles. The public must be consulted and must therefore have access to data on the ecology and control of weeds so they can voice an intelligent, informed opinion. It is felt that the present control of proclaimed weeds on roadsides, railway easements, parks, etc. is useful, even though there is some doubt that control in such situations is serving the traditional role of protecting agriculture.

76-0119. Sokolov, M. S.; Strekozov, B. P. (Inst. Agrochem. Soil Sci., Acad. Sci. USSR, USSR). **Posledovatel'nost' i nekotorye printsipy normirovaniya pestitsidov v pochve. [Consistency and some principles in the standardization of pesticides in the soil.]** *Khim. Sel'sk. Khoz.* 7: 63-66; 1975. (28 references) (Russian)

General principles and criteria for the ecological and hygienic standardization of pesticides in soil are presented. The standardization of pesticide residues in soil is possible only after such parameters as LD50, the cumulation factor for warm-blooded organisms, maximum allowable residue levels in crops, and maximum allowable concentration in drinking water and in the workplace atmosphere are known. Also, pesticide residues in the soil should be standardized for different climatic and geographic zones rather than for the entire country. The standardization of pesticides in the soil can be facilitated by means of rating scales with respect to such criteria as persistence in soil, effect on soil enzymes and microorganisms, vertical migration within the soil, translocation into crop plants, phytotoxic effects, reaction to solar radiation, maximum allowable residue level in crops, maximum allowable concentration in water, the effect on the organoleptic properties of the crop and drinking water, volatility, toxicity in warm-blooded organisms, and cumulation in warm-blooded organisms. This approach also makes it possible to predict the ecological and hygienic hazards of new pesticidal preparations.

76-0120. Korchagin, V. N. (Plant Protection Station, Exhibition of USSR National Economy Achievements, USSR). **Khimicheskie i biologicheskie preparaty dlya bor'be s vreditel'yami i boleznyami rasteniy v kollektivnykh i priusadebnykh sadakh. [Chemical and biological preparations against pests and plant diseases on collective farms and kitchen gardens.]** *Khim. Sel'sk. Khoz.* 13(8): 75-77; 1975. (Russian)

Instructions and indications concerning the use of different chemical and biological plant protective materials and their toxicity are presented. Sayphos (menazon), phosalone, ether sulfonate (ovex), entobacterin-3, and boverin are practically harmless for bees and other useful insects when used in the prescribed doses. Ether sulfonate should be used in doses of 5-6 kg/ha, and at least 45 days before harvesting. Both sayphos and ether sulfonate have low toxicity in the human organism. Both entobacterin-3 and boverin are harmless for warm-blooded organisms.

76-0121. Yoshida, K.; Kobayashi, N. (Natl. Agric. Chem. Inspect. Stn., Minist. Agric. For., Kodaira, Tokyo, Japan). **[List of recently registered new pesticides and designations for their application.]** *Kongetsu No Noyaku (Agric.Chem. Mon.)* 19(10): 88-95,97-106; 1975. (Japanese)

The officially approved application ranges (crops to be protected, target pests, use dilutions, application intervals) and the time of the last application of newly registered pesticides were tabulated. Not included are herbicides, plant growth regulators, rodenticides, repellents, attractants and adhesive agents. Applications for registration of these pesticides were submitted after the requirement for detailed registration data came into force. The compounds presented were those registered by Aug. 15, 1975. The pesticides tabulated here, with the designation of the last application, have passed the evaluation of their general toxicity and of their residues (especially in crops).

76-0122. Benz, U.; Cremer, H. D. (Inst. Ernaehrungswissensch. I, Justus-Liebig-Universitaet Giessen, Giessen, Germany). **Pathogene Faktoren in Lebensmitteln pflanzlicher Herkunft. [Pathogenic factors in food of plant origin.]** *Med. Klin.* 70(43): 1721-1728; 1975. (13 references) (German)

General hygienic and toxicological aspects of pesticide residues in foods of plant origin are discussed with respect to related legislation in West Germany. Regulations have been issued concerning the mode and time of application, applicable doses on crops, and necessary waiting times between application and harvesting to maintain the pesticide residues within acceptable limits. Pesticide residue analysis in foods should be oriented not only toward the original substance applied but also to possible metabolites which may be hygienically objectionable. Zero tolerance is required for pesticides in dietetic and baby foods. The maximum allowable concentrations imposed in West Germany are 15 ppm for captan, 3 ppm for carbaryl and dithiocarbamates, 1 ppm for DDT, and 0.5

ppm for malathion and parathion. Results of recent residue analysis of foods of plant origin show no real dangers for the population. In one campaign, 70% of 3,000 fruit, vegetable, and grain samples were found residue-free, and the respective maximum allowable residue levels were exceeded in only 3% of the samples.

76-0123. Ramasso, J. C. (Nat. Inst. Pharmacol. Nutr., Dep. Social Welfare, Buenos Aires, Argentina). **Enzimologia e intoxicacion por plaguicidas.** [**Enzymology and pesticide poisoning.**] *Medicina (Buenos Aires)* 32(6): 667-671; 1972. (22 references) (Spanish)

The role of enzymology in diagnosis and treatment of pesticide poisoning is reviewed. Monitoring the blood chemistry of workers exposed to possibly poisonous substances can be a means of early diagnosis, where chronic toxicity has been initiated but has not yet produced toxic symptoms. A table is given of 11 enzymes whose altered serum levels would call for investigation; it gives an enumeration of the tissues usually affected. Continued study of the interaction of enzmes with toxic substances will also lead to new methods of treatment for poisoning. More attention needs to be given to the potentiating effect that certain drugs could have when combined with pesticide action. The role of hepatic microsomes also needs more study, as in the case of the acetylcholinesterase-inhibiting action of the organophosphates, where chemical stimulation of the proper enzymes could lead to the formation of nontoxic metabolites that could easily be eliminated from the organism.

76-0124. Netsch, W. (Staatliches Verterinaermed. Pruefungsinst. Berlin, Minist. Land-, Forst- und Nahrungsgueterwirtschaft, Berlin, DDR). **Veterinaertoxikologische Probleme des Einsatzes von Pflanzenschutzmitteln und Wege zu ihrer Loesung.** [**Veterinary-toxicological problems involved in the use of plant protectives and possibilities for their solution.**] *Nachrichtenbl. Pflanzenschutzd. DDR* 29(6): 131-134; 1975. (German)

Acute and subacute poisonings by pesticides in domestic animals in East Germany are evaluated, and possibilities of abating such incidents are presented. Poisonings occur most often in cattle. Such poisonings were responsible for 36 cases or 25.4% of all accidents in 1972, against 23 cases or 14.5% in 1973. Most poisonings were due to organochlorine and organophosphate pesticides, and to the ingestion of fodder and water contaminated with DNOC and chlorate. Poisonings in swine occurred in 21 cases or in 19.8% of all incidents in 1972, against 16 cases or 9.3% in 1973. Most poisonings were due to warfarin and seeds treated with organomercurials. A few poisonings in sheep were due to lindane, chlorate, and DNOC. Poisonings in small poultry yards were usually due to zinc phosphide type rodenticides. Poisonings of domestic animals can be abated by toxicological tests on useful animals before official approval and by the implementation of safety standards concerning the use of pesticides, waiting periods, and restrictions on the use of contaminated feedstuffs.

76-0125. Prien, S. (Sekt. Forstwirtsch. Tharandt, Tech. Univ. Dresden, DDR). **Zur Verhinderung von Schaeden an Niederwild durch die in der Deutschen Demokratischen Republik eingesetzten Pflanzenschutzmittel.** [**Preventing injuries to small game caused by the plant protection agents used in the DDR.**] *Nachrichtenbl. Pflanzenschutzd. DDR* 29(6): 137-140; 1975. (10 references) (German)

General hazards of pesticides used in East Germany to small game and possibilities for their prevention are reviewed. While pesticides represent potential hazards to small game, there is no direct, general relationship between the rather sparse small game population and the use of pesticides. Locally occurring damages are usually due to overdosage, improper pesticide application, or coincidence of pesticide application with extreme weather conditions or epidemic diseases. Rodenticides, especially preparations based on zinc phosphide, are among the most hazardous pesticides to small game in general and to fowl in particular. Poisoning hazards can be abated by limiting the use of pesticides to agricultural areas, by adequate application techniques, and by the simultaneous distribution of repellents for nontarget species.

76-0126. Tinker, J. (Author address not given). **Vapona: overkill for household flies.** *New Sci.* 66(946): 196-199; 1975.

The U.S. Environmental Protection Agency is reconsidering the safety of Shell's "nerve gas" flystrip Vapona, which is already banned in Holland but which currently outsells every other domestic insecticide in Britain. Dichlorvos is the principal active ingredient in this product, and dichlorvos at household concentrations appears to affect three physiological variables: plasma cholinesterase, electromyography readings, and airway resistance. In Shell's view, however, none of these changed parameters is any indication of harmful effects. There is some indication that dichlorvos may also be mutagenic, although it is unlikely that it is carcinogenic or teratogenic. Furthermore, there is evidence that the Vapona strips contain Dipterex and TMP in addition to dichlorvos; TMP is a known mutagen. Although Shell argues that the strips produce insecticide concentrations well above the lethal level for insects and well below the toxic level for man, the airborne concentrations vary when the strips are not used according to instructions on the labels; in any case, the safe airborne concentrations for dichlorvos are not firmly established. Since flies are an aesthetic rather than a medical problem in Britain and most of the U.S., and since they can be controlled by other means which pose no danger to humans, a product like Vapona should only be allowed if it has been proven to be totally, completely safe.

76-0127. Yamashita, K.; Ikuta, N. (Dep. Pathol., Shuto Gen. Hosp., Japan). [**The characteristic features of pesticide intoxication.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(2): 92-93; 1975. (Japanese)

Clinical aspects of a suicide by a 31-year-old man

by the swallowing of a small cupful of paraquat dichloride (24%) were described. Death occurred 12 hr after ingestion. The abnormal findings obtained before death were: peripheral neutrocytosis; increases in serum alkaline phosphatases, transaminase, and LDH; decrease in potassium, chloride, and calcium; and increases in creatinine and phosphorus in serum. The autopsy performed 6 hr after death revealed adrenal atrophy and a general tendency towards hemorrhage, degenerative atrophy, and disturbances of circulation. Histochemically, conspicuous pathological changes were observed as hypoadrenalism. Toxic neuropathy, consisting of chromatolysis of nerve cells, degeneration or disappearance of the medullary sheath of medullated nerves, and slight hemorrhage around the vessels was observed from brain stem and spinal cord to the peripheral nerves. Focal degeneration and cytolytic necrosis were found in the heart, liver, gastrointestinal system, kidney, bladder mucosa, pituitary, and adrenals. The direct cause of death appears to be pulmonary congestive hydropsy and disturbance on circulation with stress of the hypothalamus, pituitary, and adrenals.

76-0128. Ormantaev, K. S.; Rakhmanova, M. N. (Dep. Pediatric Surgery, Alma-Ata Med. Inst., USSR). **Analiz prichin letal'nosti pri ostrykh otravleniyakh u detey. [Analysis of fatal cases of acute poisoning in children.]** *Pediatriya (Moscow)* 5: 30-31; 1974. (Russian)

The causes of 40 fatal acute poisonings that occurred in children in the region of the Alma-Ata Pediatric Institute during the 1966-1971 period are analyzed. Thirty-four of these children were under 5 yr of age; 27 were younger than 3. Fatal poisoning was due to trichlorfon in 3 cases. Most of the fatal poisonings were due to drugs.

76-0129. Mazzei, E. S.; Mazzei, C. M. (School of Medicine, University of Buenos Aires, Buenos Aires, Argentina). **Porfiria por hexaclorobenceno. [Porphyria induced by hexachlorobenzene.]** *Pren. Med. Argent.* 59(32): 1205-1211; 1972. (29 references) (Spanish)

A 24-year-old farmworker whose occupation required the handling of hexachlorobenzene and other pesticides was admitted to the University of Buenos Aires hospital on Feb. 10, 1971 with the classic symptoms of porphyria after six months of other complaints. After a year of treatment with edetic acid, adenosine monophosphate, and vitamin B complex, avoidance of exposure to the sun, special diet, and change of occupation, improvement was noted; skin symptoms and dark urine disappeared and were not recalled by exposure to the sun, but hexachlorobenzene was still detected in the blood (although at a lower level). Some of the enzymes were still at abnormal levels, and there were still excessive uroporphyrins in the stools. Hepatic puncture also revealed that porphyrin-type pigments persisted in the liver.

76-0130. Papworth, D. S. (MAFF Pest Infestation Lab., Slough, England). **Agricultural chemicals and safety.** *Proc. Inst. Fd. Sci. Technol. (U.K.)* 7(4): 217-219; 1974. (8 references)

Britain's Pesticides Safety Precautions Scheme is an arrangement between industry and government whereby all pesticides are subjected to an appraisal and registration procedure following notification by the firm concerned. Indications are that the Scheme has proved effective and that agricultural chemicals are being used effectively and with care throughout the U.K. There were no pesticide-related deaths among agricultural workers between 1968 and 1971, and injuries attributable to pesticides were far less numerous than those attributed to tractor accidents and falls. Similarly, pesticide residues in food and human tissues in the U.K. are comparatively low, and there appears to be no threat to any wildlife species in the U.K. that is unequivocally attributable to the use of agricultural chemicals. According to the Safety Scheme, the distributor, manufacturer, servicing operator, or importer must provide sufficient information to satisfy government departments that the chemical or formulation which he plans to use or introduce will be safe when used in the prescribed manner. Safety phrases for the product label are the major result of this procedure. Despite the financial constraints which now face the pesticides industry in research and development, it is hoped that the further introduction of reliable scientific methods will continue to reduce the areas of uncertainty associated with pesticide registration.

75-0131. Fraumeni, J. F., Jr., (Natl. Cancer Inst., Natl. Inst. Health, Bethesda, M.). **Chemicals in the induction of respiratory tract tumors.** *Proc. Int. Cancer Congr., 11th* 3: 327-335; 1974. (74 references)

In this extensive review of chemicals involved in the etiology of respiratory tract tumors, some reference is made to studies in which pesticides have been shown to be the inducing agent. In 1948 a study appeared which examined the proportionate mortality of workers involved in the manufacture of sheep dips containing inorganic arsenicals. A relative excesss of deaths from cancers of the lung and skin was found among heavily-exposed, but not among unexposed, workers in the factory. Very recently, two American companies which produced arsenic-containing herbicides and pesticides reported excessive mortality rates for lung cancer among their employees who handled arsenic. Arsenic derived from pesticides has been found in tobacco smoke, but the suggestion that it may be responsible for the lung cancer risk in smokers is not generally considered likely.

76-0132. Conolly, M. E. (Dep. Clin. Pharmacol., Roy Postgrad. Med. Sch., London, W12OHS, England). **Paraquat poisoning—clinical features.** *Proc. R. Soc. Med.* 68(7): 21-22; 1975.

Paraquat, a bipyridyl compound, is a widely used herbicide of global importance. Poisonings from this compound rarely occur after it is applied as intended. Most poisoning occurs due to the concentrated forms, often after storing the herbicide in unlabeled containers. Not

only has paraquat been ingested accidentally, it has been extensively used for homicide and suicide. In reviewing 18 cases of paraquat poisoning, all but 2 were classified as attempted suicides. Eight of the 18 survived. Data suggests that absorption of 20-40 mg/kg (between 1 and 2 g for a 70 kg male) can be fatal. Once absorbed, the poison is widely distributed throughout the body tissues. Progressive toxicity occurs. Early symptoms include irritation of the mucosa of the gastrointestinal tract and associated conditions. The concentrate often causes burning of the mouth and pharynx, and extensive ulceration may appear in a day or two. Gastric irritation may cause nausea and vomiting, and diarrhea, sometimes bloody, may follow. Massive doses kill within a few hours, apparently due to effects on organs other than the lungs. If they survive past the comatose condition and convulsions, patients experience respiratory or cardiac arrest, and show derangement of liver function due to centrilobular necrosis and renal failure due to acute tubular necrosis. Radiological changes in the lungs appear 2 to 3 days after ingestion. In early stages, the predominant lesion is pulmonary edema. If survival is prolonged, destruction of lung architecture is seen and a fibroblastic reaction leading to diffuse fibrosis ensues. Death results from respiratory failure.

76-0133. Davies, J. E. (Author address not given). **Los pesticidos y el ambiente. [Pesticides and the environment.]** *Rev. Vet. Venez.* 32(190): 360-374; 1972. (Spanish)

The etiology, diagnosis, and treatment of organophosphate poisoning; occupational safety measures to be implemented in the use of organophosphate insecticide; the epidemiology of DDT poisoning; and future planning at national and international levels to combat environmental problems created by extensive use of pesticides are discussed. Determinations of pH and of plasma and red cell cholinesterase by the Michel method provide an indicator of incipient poisoning. In the state of Florida, workers with an erythrocyte reading (Michel) of 0.40 or less are banned from further exposure to the toxic substances. Treatment should include 4 steps: restoration of respiratory function, use of atropine and the oximes as antidotes, decontamination of the skin and organs, and investigation of the work site where poisoning occurred. An essential item in further control measures is the formation of 4-man teams consisting of a crop-protection specialist, a public health specialist, a chemist, and a biologist.

76-0134. Buchinskiy, V. I. (Kherson District Forensic Medical Station, USSR). **Smertel'noe otravlenie dinokom (dinitrokrezolm). [Fatal poisoning with dinitrocresol.]** *Sud. Med. Ekspert.* 17(1): 52-53; 1974. (Russian)

Fatal poisoning with dinitrocresol (DNOC) is reported in a 4-year-old boy after skin application of 50 g of an ointment prepared erroneously with this substance. Emesis and headache were the first symptoms of the poisoning after skin resorption. Jaundiced skin, especially on the limbs; tachypnea; weak heartbeat; and severe general depression were observed. The boy died 3.5 hr after the application of the ointment despite therapeutic intervention. Autopsy revealed focal hemorrhages in the intestinal mucosa; pronounced capillary plethora of the brain, liver, lungs, intestinal walls, myocardium, and kidneys; and edema of the lung and brain. Dinitrocresol was found only in the blood. The ointment contained 25% dinitrocresol.

76-0135. Tomashivskiy, D. I. (Dep. Skin and Venereal Dis., Ivano-Frankovsk Med. Inst., USSR). **Professional'nye dermatozy rabochikh, zanyatykh vypuskom yadokhimikatov. [Occupational dermatoses in workers dealing with fungicides.]** *Vestn. Dermatol. Venerol.* 4: 59-62; 1975. (4 references) (Russian)

Contact dermatitis localized on the neck, around the eyes, and on the forearms, shoulders, abdomen, and sides of the chest was found in 21.4% of the workers exposed to zineb in a production plant. More or less pronounced erythema and edema, dryness, and ulceration of the skin were observed. These developments were enhanced by microtraumas of the skin. The introduction of technological modifications and prophylactic measures (increased airtightness of the industrial equipment and strict compliance with the safety rules, including the use of special working clothes, gloves, and respirators) has resulted in a reduction of the incidence of skin affections from 21.4 to 3.25%. Silicone creme proved to be most effective in the prophylaxis and treatment of the dermatitis.

76-0136. Karimov, A. M. (Dep. Skin Venereal Diseases, Tashkent Med. Inst., USSR). **Lechenie bol'nykh dermatozami, vyzvannymi pestitsidami. [Treatment of pesticide induced dermatoses.]** *Vestn. Dermatol. Venerol.* 5: 64-65; 1975. (Russian)

The treatment of dermatoses induced by agricultural pesticides is described in 159 patients (61 males, 98 females, aged 21 to 40 yr, with occupational exposure for 1 month to 3 yr). One hundred and twelve patients had been in contact with BHC, 47 with seed-dressing agents (copper trichlorophenolate, thiram) and defoliants (calcium cyanamide, magnesium chlorate, and pentachlorophenol). Dermatitis was diagnosed in 125 patients, eczema in 32 patients, and toxicoderma in 2 patients. Dryness, cracking, edema, erythema, and papulovesicular eruptions were the most common symptoms. These symptoms either were alleviated or totally disappeared after cessation of contact with the pesticides. The patients were treated with ethacridine, furacillin, and boric acid.

76-0137. Anonymous. **Poisoning, pesticides and pets.** *Vet. Rec.* 97(9): 157; 1975.

For a variety of reasons, often because they have been used for a purpose for which they were not intended, pesticides may be ingested by animals, causing toxic symptoms. When the veterinarian is confronted with a suspected case of poisoning, the first problem is identification of the toxic agent. Even when the agent is identified, however, there may be no specific antidote for it. Although there is no funding available to services such as the National Poisons Information Service

at Guy's Hospital in London (a 24-hr information source for incidents involving humans) for animals, sources of information are available. The British Veterinary Association's technical information service has dealt with a considerable number of requests from members needing guidance in obtaining information in suspected cases of poisoning. In dealing with such requests, wholehearted cooperation has been given by the British Agrochemical Manufacturers' Association.

76-0138. Anonymous. **V ministerstv sel'skogo khozyaystva SSSR. [Regulations issued by the Ministry of Agriculture of the USSR.]** *Veterinariya (Moscow)* 7: 119,125; 1975. (Russian)

Temporary regulations on the use of trichlorfon for bathing cattle and sheep for tick control are presented. Cattle should be bathed in solutions containing 0.75% trichlorfon, while a 0.5% solution should be used for sheep. The animals should be bathed every 6-7 days during the tick season. Sheep should be kept in open pens for 2-3 hr after bathing. The necessary waiting time between bathing and slaughtering should be 10 days for cattle, and 6 days for sheep. The meat of animals slaughtered at earlier dates can be used after storage at 0.4°C for 12 days.

76-0139. Prezdziak, J.; Bakula, S. (Inst. Internal Med., Acad. Med., Gdansk, Poland). **Ostre zatrucie 1,2 dwuchloroetanem. [Acute poisoning with 1,2-dichloroethane.]** *Wiad. Lek.* 28(11): 983-987; 1975. (12 references) (Polish)

The pathological effects are discussed for 1,2-dichloroethane, which has a wide range of application as a solvent, fumigant, fire-extinguishing compound (with CCl_4), and therapeutic agent (although very rarely now, in ointments). This compound is considered highly toxic if inhaled or taken orally. Its action is diphasic: a narcotic effect can lead to paralysis of the respiratory center, and gastrointestinal symptoms are clinical manifestations of severely damaged liver and kidneys. As is the case with other solvents, 1,2-dichloroethane also affects the circulation, causing cardiac dysrhythmias and cardiogenic shock. It may also damage the thrombocytic membrane and thus lead to hemolysis. Since reports on the effects of 1,2-dichloroethane intoxication in the literature are rather rare, the authors present the case of a 25-year-old man who drank 50 ml of the compound with suicidal intention. He was hospitalized with grave clinical symptoms of the G.I. tract along with jaundice and urinary retention, complicated by hepatic coma. He was given heparin to control a possible hemostatic disorder resembling consumption coagulopathy, and hydrocortisone. A liver biopsy performed on the 14th day of hospitalization indicated the characteristics of acute hepatotoxy. Steroid and heparin therapy was continued. Renal symptoms subsided and no permanent kidney lesion could be established. A second liver biopsy carried out on the 70th day showed signs of cicatrization. The improvement of the patient remained evident and he was discharged on the 87th day in good condition. Except an area of somewhat harder (cirrhotic) consistency in the liver, no deviation from a normal condition was noticed on subsequent outpatient checkups.

76-0140. Przezdziak, J.; Wisniewska, W. (Inst. Internal Med., Acad. Med., Gdansk, Poland). **Przypadek ostrego zatrucia zwiazkiem fosforoorganicznym. [A case of acute orgnophosphate poisoning.]** *Wiad. Lek.* 28(12): 1093-1095; 1975. (10 references) (Polish)

Repeated organophosphate ingestion in small doses has a highly deleterious effect; it is based on the inhibition of acetylcholin esterase activity at the nerve endings with an eventual curare-like effect on the muscle system which supports respiration threaten asphyxiation. Although this process is reversible, the breakdown of the enzyme-organophosphate complex is very slow. Rapid absorption of the poison may be fatal if the enzyme activity is reduced to 50%. Its ability to penetrate the blood-brain barrier rapidly is crucial. Acetylcholinesterase restoration after severe organophosphate intoxication requires months or even longer in the brain, as animal experiments determined. A case of severe organophosphate poisoning in a 54-year-old man is described. When admitted to the hospital, the patient showed general symptoms of first degree poisoning, and appropriate therapy and medication were applied. He was unable to suggest the source of his trouble. On the following day, it was divulged that he had taken half a teaspoonful of an insecticide, nuvacron (monocrotophos), by mistake. Consciousness returned on the 4th day of his hospitalization. Recovery was slow and complicated by bilateral bronchopneumonia and extensive thrombophlebitis. Discharge in good condition occurred after 33 days.

See also **76-0002** **76-0059** **76-0074** **76-0092** **76-0093** **76-0098** **76-0037** **76-0112**

76-0141. Blau, G. E.; Branson, D. R. (Dow Chem. Co., Midland, MI 48640). **Ecokinetics: a study of the fate and distribution of chemicals in laboratory ecosystems.** *AIChE J.* 21(5): 854-861; 1975. (21 references)

The sequential concentration-time data generated during and/or after the time when a chemical is introduced into a laboratory ecosystem can be characterized by compartmental analysis. This paper presents a model building procedure based on the principle of parsimony, which can be followed by a modeling team to ensure generation of the least complex model warranted by the data. Two examples of ecokinetic modeling are presented. The first example involves the modeling of a bioconcentration test for different chemicals using fish as the test organism. Different chemicals can be easily classified not only by their long exposure steady state concentrations, but also by the rates of uptake and clearance for different exposure times and levels. This model predicts the bioconenctration potential from relatively short exposure periods for chemicals which bioconcentrate slowly. This procedure was adopted as a technically and economically attractive environmental screening tool because of cost savings. The second example presented involves the use of ecokinetics to determine the distribution and ultimate fate of the active ingredient in a new insect control agent, Dursban (chlorpyrifos) insecticide, which was introduced instantaneously into an aquatic ecosystem containing fish, soil, and plants. Compartmental analysis characterizes the sequential chemical concentration-time data for the water, soil, plants, and fish. Important stages in the distribution process are thus identified. Studies such as these of the agricultural chemicals may serve as an effective screening tool by identifying both environmentally attractive and unattractive features at a very early stage of development and by providing benchmark parameters for evaluating products under development.

76-0142. Jones, L. S.; Anderson, O. E.; Dowler, C. (Univ. Georgia Coll. Agric. Exp. Stn., Experiment, GA 30212). **Effects of herbicides in a crop-herbicide rotation on sulfur oxidation in Titfon soil.** *Agron. J.* 66(6): 744-747; 1974. (10 references)

In order to produce crops on light-textured soils, the farmer is often dependent on the microbial oxidation of sulfur from soil organic matter or S-amended fertilizers. The possible effect of herbicides on the oxidation of sulfur was therefore investigated. A field of Tifton ls soil was selected as the site for experimentation. Herbicides had been applied for 3 years to this soil on which corn, soybeans, cotton, and peanuts were continuously grown and rotated. The chemicals used, which included fluometuron, EPTC, MSMA, diuron, butylate, atrazine, linuron, vernolate, chloroxuron, dinoseb, benefin, pyrichlor, and 2,4-DB, were applied at the recommended rates and with recommended methods. During the third year soil samples were collected from the 0 to the 15 cm layer of all plots. Elemental sulfur was added to the samples, they were incubated at 32°C, and the sulfates were determined at 10-day intervals. In all samples oxidation of the added sulfur proceeded. During the first 10 days the accumulation of sulfate was slow, but it was never completely inhibited. By the 40th day of incubation the added sulfur was completely oxidized to sulfate regardless of soil treatment. The combination of herbicides applied to soybean and peanuts tended to affect sulfofication more than those applied to corn and cotton, although this difference was very slight.

76-0143. Desaiah, D.; Cutkomp, L. K.; Jarvinen, A. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **DDT: effect of continuous exposure on ATPase activity in fish, *Pimephales promelas*.** *Arch. Environ. Contam. Toxicol.* 3(2): 132-141; 1975. (22 references)

Fathead minnows, 45 days old, were continuously exposed to DDT using continuous water flow and constant temperature conditions. Exposures were to 0.5 and 2.0 ppb of DDT in water, and combinations of the two concentrations with 50 ppm in food, and 50 ppm in food alone, using C^{14}-DDT in food. Brain homogenates were analyzed for enzyme activity from fish treated for 56, 118, 225, and 266 days; and gill analysis was made at 225 and 226 days exposure. Enzyme reductions were greatest in oligomycin-sensitive (mitochondrial) Mg^{2+} ATPase, with pronounced effects (over 50% inhibition) at the 266th sampling day. In contrast, Na^{+}-K^{+} ATPase and oligomycin-insensitive Mg^{2+} ATPase of fish brain has been inhibited to the greatest extent in previously reported in vitro studies. All three ATPase enzymes were reduced in gill tissue sampled at the 266th day, with mitochondrial Mg^{2+} ATPase showing the greatest decline. (Author abstract by permission)

76-0144. Cecil, H. C.; Harris, S. J.; Bitman, J. (Anim. Physiol. Genet. Inst., Beltsville, MD 20705). **Effects of polychlorinated biphenyls and terphenyls and polybrominated biphenyls on pentobarbital sleeping times of Japanese quail.** *Arch. Environ. Contam. Toxicol.* 3(2): 183-192; 1975. (20 references)

Polychlorinated biphenyls (Aroclor 1221, 1232, 1242, 1248, 1254, 1260, 1262 and 1268), polychlorinated terphenyls (Aroclor 5460), a mixture of polychlorinated biphenyls and terphenyls (Aroclor 4465) and polybrominated biphenyls (BP-6) were administered in a single dose, 100 mg/kg body weight injected orally, to mature male and female Japanese quail. Two hr after Aroclor treatment, pentobarbital sleeping times were prolonged (2 to 3 x control) in both male and female quail. Twenty-four hr after treatment, sleeping times were similar to those of controls. However, 48 hr after treatment with Aroclor 1248 through Aroclor 5460 and with BP-6, sleeping times of males were only 1/2 those of controls, whereas after treatment with Aroclor 1221, 1232 and 1242, sleeping times were similar to those of controls. The reduction in sleeping times of male quail 48 hr after administration of PCBs was correlated with the percentage of chlorine in the PCB with greater

reductions in male than female quail. The response after three days ad libitum feeding of 300 ppm of each substance was the same as the response 48 hr after a single oral injection. Although very few birds died from the toxicity of the Aroclors and BP-6, mortality was greatly increased during anesthesia when the pentobarbital was administered two hr after single oral dosing. (Author abstract by permission)

76-0145. Gabliks, J.; Al-zubaidy, T.; Askari, E. (Dep. Biol., Coll. Liberal Arts, Northeastern Univ., Boston, MA 02115). **DDT and immunological responses.** *Arch. Environ. Health* 30(2): 81-84; 1975. (24 references)

Previous work showed that anaphylaxis, mast cell population, and tissue histamine content are reduced in guinea pigs given DDT injections. This study was intended to determined whether dietary intake of DDT causes similar effects. Rats immunized with diphtheria toxoid and fed diets containing DDT at 20 and 200 ppm levels for 31 days did not show effects on their serum antitoxin titers, but the numbers of metachromatically stained, histamine-containing mast cells in mesenteries were reduced: in the 20 ppm group by 46% and in the 200 ppm group by 61%. The severity of anaphylactic shock was also reduced in proportion to the DDT dietary levels, and thus, the magnitude of the shock correlated with the numbers of mast cells. Apparently, daily dietary DDT intake above 2.2 mg DDT/kg of body weight alters the physiology of mast cells in the rat, and thus affects histamine-mediated reactions. (Author abstract by permission)

76-0146. Bhagwat, V. M.; Ramachandran, B. V. (Biochem. Div., Natl. Chem. Lab., Poona, India). **Malathion A and B esterases of mouse liver. II. Effect of EPN in vitro and in vivo.** *Biochem. Pharmacol.* 24(18): 1727-1729; 1975. (13 references)

Mice were injected i.p. with varying volumes of EPN and were sacrificed 1 hr later. Malathion A and B esterase activities were determined. In vitro EPN to 1.0 μM inhibited malathion A and B esterases by 17% and 13%, respectively. EPN's oxygen analogue, EPNO, strongly inhibited the B esterase but had no effect on the A esterase. When EPN was injected into mice at dose levels of 5-10 mg/kg, the malathion B esterase activity decreased by up to 54%; increasing the dosage further had no appreciable additional inhibitory effect on the B esterase. When the inhibited homogenates were incubated with 1.0 $\pm\mu M$ DFP, the residual malathion B esterase activity was almost completely inhibited. When EPN (30-40 mg/kg) was injected into mice pretreated with atropine sulfate and toxogonin, and malathion B esterase activity remained at the same level. The residual activity was inhibited by DFP, paraoxon, or EPNO. When esterase activity was determined using phenyl acetate as the substrate, the B esterase activity was almost completely inhibited by injected EPN. With malathion as the substrate, only part of the activity was inhibited by EPN. Injected ENP significantly increased the activity of malathion A esterase; the interval between injection and sacrifice did not appear to alter this effect. Only EPN and its P and S containing degradation products had this enhancing effect.

76-0147. Lissner, R.; Goerz, G.; Eichenauer, M. G.; Ippen, H. (Univ.-Hautklinik, Dusseldorf, Germany). **Hexachlorobenzene-induced porphyria in rats—relationship between porphyrin excretion and induction of drug metabolizing liver enzymes.** *Biochem. Pharmacol.* 24(18): 1729-1731; 1975. (16 references)

5-Aminolevulinic acid (ALA) and porphyrin levels were estimated in the 24-hr urine specimens of 60 male Wistar rats fed a diet containing 0.2% HCB. In addition, the animals were sacrificed at weekly intervals and the concentrations of cytochrome P-450, microsomal protein, and triglycerides and the activity of aniline hydroxylase were determined in the liver. After the fortieth day of HCB treatment, the excretion of ALA and porphyrins in the urine was markedly elevated. However, the level of cytochrome P-450 and the activity of aniline hydroxylase in the liver were elevated during the first week. After an initial 3-fold rise in cytochrome P-450 there was a second steep rise after the thirtieth day of treatment; the aniline hydroxylase activity curve showed a similar pattern. During the early period of HCB exposure, microsomal enzyme induction could lead to the oxidation of HCB, the resulting metabolite possibly being the actual porphyrogenic agent and a more potent inducer of the microsomal enzymes than unchanged HCB.

76-0148. Stonard, M. D. (Biochem. Mechanisms Sect., MRC Toxicol. Unit, Med. Res. Council Lab., Carshalton, Surrey, England). **Mixed type hepatic microsomal enzyme induction by hexachlorobenzene.** *Biochem. Pharmacol.* 24(21): 1959-1963; 1975. (40 references)

A comparison of microsomal spectral changes induced by 3-methylcholanthrene, phenobarbitone and hexachlorobenzene has been recorded. In addition, changes after hexachlorobenzene treatment have been examined for microsomal turnover in CO-binding particles. Hexachlorobenzene, like 3-methylcholanthrene, alters the spectral characteristics of cytochrome P-450 by shifting its peak to 448 nm. Administration of 5-amino[4-^{14}C]levulinate to untreated and hexachlorobenzene-treated rats leads to the incorporation of radioactivity into the hemoprotein(s) of the CO-binding particles obtained from liver microsomes. There is a biphasic loss of radioactivity from the CO-binding particles in both normal and hexachlorobenzene-treated rats. Half-life determinations show that hexachlorobenzene increases the half-life of the fast phase component but not the slow phase component. As a result of these and previous studies, it is proposed that hexachlorobenzene is representative of a new class of inducers which shares the properties of both the polycyclic hydrocarbon group and the phenobarbitone, chlordane group. (Author abstract by permission)

76-0149. Uchiyama, M.; Takeda, M.; Suzuki, T.; Yoshikawa, K. (Natl. Inst. Hyg. Sci., Kamiyoga, Setagaya, Tokyo, Japan). **Mutagenicity of nitroso derivatives of *N*-methylcarbamate insecticides in microbiological method.** *Bull. Environ. Contam. Toxicol.* 14(4): 389-394; 1975. (6 references)

Eight kinds of *N*-methylcarbamate insecticides were chemically converted to corresponding *N*-nitroso compounds. Two microbiological assay systems were used to test the mutagenic activities of these compounds. The carbamate insecticides investigated included 2-*sec*-butylphenyl-, 2-isopropylphenyl-, 2-isopropoxyphenyl-, 3,4-xylyl-, 3,5-xylyl-, 2-chlorophenyl-, 3-tolyl-, and 1-naphthyl-*N*-methylcarbamate. Original, non-nitrosated carbamates did not show any positive results in either method, even in the highest concentration studied, 10 mg/plate. All 8 of the nitrosocarbamates exhibited far stronger DNA-damaging effects than MNNG and most of them were comparable to or more potent than mitomycin C. It is noted that nitroso-BPMC and nitroso-MIPC were the most effective compounds when tested by rec-assay, whereas these 2 compounds induced minimum mutation in *E. coli* system. The reverse response was also found in that nitroso derivatives of CPMC and MTMC which were the most potent in *E. coli* system showed a relatively mild effect on the rec-assay system. The structure of those derivatives showing extraordinarily high response to rec-assay had a rather massive branched side chain in the *ortho*-position of phenylcarbamates. Simple and monosubstituted methyl and chloro derivatives brought the greater induction of back mutation. *N*-Nitroso derivatives derived from dimethyl substituted MPMC and XMC occupied the intermediate place in both assay methods. It is noted that all of these *N*-methylcarbamates which are generally accepted as "safe" pesticides could be converted to nitroso compounds and the nitroso derivatives are all potent mutagens. Carbamates have been widely used, nitrite is a common constituent of human saliva, and the stomach can provide the acidic conditions which will aid nitrosation.

76-0150. Van Dyk, L. P.; Greeff, C. G.; Brink, J. J. (Plant Protection Res. Inst., Private Bag X134, Pretoria 0001, South Africa). **Total population density of Crustacea and aquatic Insecta as an indicator of fenthion pollution of river water.** *Bull. Environ. Contam. Toxicol.* 14(4): 426-431; 1975. (3 references)

Fenthion, useful in controlling Red-billed Quelea birds, must be sprayed along the riverside and on islands where the birds roost at night. Although care is usually taken to minimize drift, contamination of the river usually occurs. Experimental tests were made of a monitor program involving both the population density of aquatic Insecta and Crustacea, and the residue analysis of water samples. Fenthion was applied in the tests aerially as a 50:50 mixture of the 40% oil miscible formulation and diesolene at a rate of six liters of active ingredient/ha. Three separate water samples were collected at the sampling localities. Water samples were analyzed by GLC. The results of the study showed that total population density was a sensitive indicator of fenthion pollution and can be used when no analytical facilities are available. While sampling for chemical analysis is usually limited in volume and frequency, the Crustacea and aquatic Insecta populations are continually present to monitor pollution. Compared to the use of sophisticated collection samplers or resins, this is also an inexpensive method. The only prerequisite is that the total population density before pollution must be known, and this can be established by long-term observations.

76-0151. Walker, E. M., Jr.; Gale, G. R.; Atkins, L. M.; Gadsden, R. H. (Dep. Pathol., Med. Univ. South Carolina, Charleston, SC 29403). **Some effects of carbaryl on Ehrlich ascites tumor cells in vitro and in vivo.** *Bull. Environ. Contam. Toxicol.* 14(4): 441-448; 1975. (17 references)

The effects of carbaryl on Ehrlich ascites tumor cells were studied with particular reference to effects on tumor development and nucleic acid synthesis. The dosages of carbaryl used in this study were: 11 mg/kg/day i.p. for 6 days, 12 mg/kg/day i.p. for 5 days, 13 mg/kg/day i.p. for 5 days, 18 mg/kg i.p. for 5 days, and 18 mg/kg i.p. for 6 days. A reduced tumor mass was found with 3 of the 5 dose regimens used. At two of these dose levels, however, toxicity was evident by death of some of the treated mice. Tumor cells were incubated in MEM in vitro for various periods after the addition of a single concentration of the compound in an effort to detect any effect of carbaryl on nucleic acid and protein synthesis. At 1.0 m*M* carbaryl, a time-dependent onset of inhibition of incorporation of each of the three precursors was noted; protein synthesis was the least sensitive of these three parameters. At a concentration of 2.0 ppm, virtually no effect on DNA synthesis was found at levels of about 20 ppm and above, however, the degree of inhibition of both nucleic acid and protein synthesis became pronounced, and substantially total inhibition occurred at just under 200 ppm. In experiments designed to determine if inhibition of macromolecular synthesis was reversible, it was learned that washing with carbaryl-free MEM of those cells which had been incubated with the inhibitor for 3 hr completely restored the rates to those observed with cells which had been incubated without carbaryl. The data from this study calls attention to the pharmacologic action of this compound quite unrelated to its action on cholinesterase, and may serve to promote more elaborate investigations of the mechanism of its teratogenic actions and other adverse effects on reproduction.

76-0152. Gupta, P. K.; Chandra, S. V. (Ind. Toxicol. Res. Cent., Lucknow, India). **The toxicity of endosulfan in rabbits.** *Bull. Environ. Contam. Toxicol.* 14(5): 513-519; 1975. (5 references)

Technical endosulfan (Indian and imported) in

chloroform was painted on the shaved trunk skin of female albino rabbits in dosages of 100-225 mg/kg. The animals were observed for 7 days, after which some were killed and their tissues examined histologically. In other experiments, Indian endosulfan (5, 10, and 20%) in aqueous suspension was dropped on the conjunctival sacs of rabbits; the animals were observed for 7 days. The acute dermal LD50 of Indian and imported endosulfan was 167 and 187 mg/kg, respectively. At 225 mg/kg, the pesticide produced various neurotoxic effects, including convulsions, tremors, and hyperexcitability. Other symptoms included dyspnea, decreased respiration, discharge from the eyes, loss of response to painful stimuli, loss of motility, loss of corneal reflex, and deep coma. At death, the kidneys, peritoneum, and muscles underlying the skin showed gross congestion and the liver showed microscopic evidence of congestion, dilation of the sinusoids, degeneration in the hepatocytes, hyperplastic Kupffer cells, focal necrosis, and portal tract and bile duct proliferation. Microscopic changes were also seen in the kidneys and adrenal cortex. The treated skin showed no abnormalities.

76-0153. Witherspoon, F. G., Jr.; Wells, M. R. (Dep. Biol., Middle Tennessee State Univ., Murfreesboro, TN 37130). **Adenosine triphosphatase activity in brain, intestinal mucosa, kidney, and liver cellular fractions of the red-eared turtle following in vitro treatment with DDT, DDD, and DDE.** *Bull. Environ. Contam. Toxicol.* 14(5): 537-544; 1975. (7 references)

Red-eared turtles (*Chrysemys scripta elegans*) captured in middle and western Tennessee were analyzed for tissue ATPase activity following in vitro exposure of tissue homogenates to DDT, DDD, or DDE (53-212 μM). DDT at 212 M inhibited the (Na^+, K^+, Mg^{2+})-dependent ATPase systems in all cellular fractions of the brain, as did 212 M DDD and 212 M DDE. Lesser concentrations of these compounds produced inhibitions in some, but not all, of the brain fractions. All three compounds significantly inhibited the ATPase activity in all cellular fractions of the intestinal mucosa, except the mitochondria, at 106 M. At 53 M, these compounds had variable effects on the different fractions. All cellular fractions of the kidney were inhibited by DDT at 106 M, by DDD at 212 M, and by DDE at 212 M; again, lower concentrations had variable effects on the different fractions. All 3 compounds significantly inhibited all cellular fractions of the liver at 212 M, and most fractions were inhibited at 106 M. In general, the effects of DDT on the Na^+, K^+, Mg^{2+})-dependent ATPase systems were not as great as those of DDD or DDE.

76-0154. Miller, D. L.; Ogilvie, D. M. (Dep. Zool., Univ. Western Ontario, London, Ontario, Canada). **Temperature selection in brook trout (*Salvelinus fontinalis*) following exposure to DDT, PCB or phenol.** *Bull. Environ. Contam. Toxicol.* 14(5): 545-551; 1975. (10 references)

Brook trout (*Salvelinus fontinalis* Mitchell, 2-3 months old) were fed, then exposed for 24 hr to DDT (10-50 ppb), phenol (0.75-10 ppm), or PCB (25-100 ppm) dissolved in the tank water. After exposure, temperature selection in these fish and unexposed control fish was tested. The unexposed fish selected temperatures in the 12.9-13.3°C range; DDT at the lower dose significantly depressed the mean selected temperature and at the higher dose significantly increased it by more than 4°C. The 24-hr LD50 for DDT was 54 ppb. Exposure to phenol produced a consistent downward shift in selected temperature; this decrease was significant at the 7.5 and 10 ppm doses. The 24-hr LD50 for phenol was estimated at 11.7 ppm. PCB exposure produced no mortality and no changes in temperature selection. Even when fish were exposed to 100 ppm PCB, which caused two deaths, there was no change in temperature selection.

76-0155. Krampl, V.; Hladka, A. (Inst. Ind. Hyg. Occup. Med., Bratislava, Czechoslovakia). **Dose-dependent extent of microsomal enzyme induction by aldrin and dieldrin in rats.** *Bull. Environ. Contam. Toxicol.* 14(5): 571-578; 1975. (7 references)

Male Wistar rats were fed aldrin or dieldrin (0.05, 0.25, 1.25, or 2.50 mg/kg) in vegetable oil for 13 days or were fed oil alone (controls). On the fourteenth day, they were killed and the oxidative detoxification of *O*-ethyl *O*-(4-nitrophenyl)phenylphosphonothioate (EPN) and the *O*-demethylation of *p*-nitroanisole by the liver microsomes were measured in vitro. At doses greater than 0.25 mg/kg, aldrin had a significant inductive effect on both microsomal enzymes. Dieldrin had an even more potent effect, the *O*-demethylation of *p*-nitroanisole being significantly increased at all dose levels and the oxidation of EPN being significantly increased at all doses greater than 0.25 mg/kg. Dose-dependent increases in liver weight and microsomal protein were also noted with aldrin and dieldrin at all dose levels except 1.25 mg aldrin and 2.50 mg dieldrin. It is concluded that relative liver weight can serve as a criterion in the evaluation of the inducing abilities of aldrin and dieldrin, but only in relation to other criteria.

76-0156. Kricher, J. C.; Urey, J. C.; Hawes, M. L. (Biol. Dep., Wheaton Coll., Norton, MA 02766). **The effects of mirex and methoxychlor on the growth and productivity of *Chlorella pyrenoidosa*.** *Bull. Environ. Contam. Toxicol.* 14(5): 617-620; 1975. (8 references)

Cultures of *Chlorella pyrenoidosa* were exposed to mirex and/or methoxychlor (total pesticide concentration 100 ppb) in acetone or to acetone alone. In comparison with the acetone controls, the population density in the mirex-treated cultures was reduced by 8% at 92 hr and by 19% at 164% hr, while the methoxychlor-treated populations were reduced by 17% at 164 hr. In contrast, the population density in the cultures treated with mirex plus methoxychlor (50 ppb each) showed little deviation from the acetone control. The results indicate that mirex and methoxychlor independently affect *Chlorella* population growth at a concentration of 100 ppb, and that the two

pesticides probably affect different physiological mechanisms. At 1 ppm, neither pesticide significantly altered gross productivity in *Chlorella* populations within a 70-hr experimental period. Acetone alone at 0.1% exerted depressing effects on both population growth and productivity.

76-0157. Van Peteghem, C. H.; Heyndrickx, A. M. (Dep. Toxicol., State Univ. Ghent, Ghent, Belgium). **Beta oxidation of chlorophenoxybutyric acid herbicides in guinea pigs.** *Bull. Environ. Contam. Toxicol.* 14(5): 632-640; 1975. (7 references)

Guinea pigs were given oral doses of 4-(2,4-dichlorophenoxy) butyric acid methyl ester (2,4-DB-CH_3, 40 mg), MCPB (40 mg), or 4-(2,4,5-trichlorophenoxy) butyric acid (2,4,5-T-CH_3, 50 mg) in soybean oil. Urine was collected over the next 24 hr and analyzed by gas-liquid chromatography (GLC) and GLC-mass spectrometry (GLC-MS). The urine from the animals fed 2,4-DB-CH_3 contained no detectable unchanged 2,4-DB, but both GLC and MS indicated the presence of 2,4-D-CH_3 and 2,4-dichlorophenoxyacetic acid methyl ester. Similarly, MCPA was found to be a guinea pig formed metabolite of MCPB, and the urine from the animal fed 2,4,5-TB contained 2,4,5-T-CH_3. In no case could any original butyric acid derivative be detected.

76-0158. Uzokwu, M. (Anat. Dep., Michigan State Univ., East Lansing, MI 48823). **Comparative feto-toxicity of organophosphate insecticide in mice.** *Bull. Epizootic Dis. Africa* 22(2): 161-166; 1974. (11 references)

Organophosphorus insecticides were injected i.p. into pregnant mice of the A/Jax strain. A total of 137 mice were used, some receiving the LD50 dose of the insecticides; others only the solvents. The insecticides used in this study included methyl parathion, parathion, malathion, diazinon, phosdrin, disyston, and systox. The 10th day of gestation was selected as the day for the earliest injection. This day marks the period of maximum organ formation in the embryos and is also the earliest time pregnancy can be detected by palpation. Consistent but non-uniform lethality to both the pregnant mice and the fetuses was obtained. The most toxic to the adult mice were disyston, diazinon, malathion, phosdrin, and systox. The lethality of methyl parathion increased with advancing pregnancy. The most toxic to the fetus was disyston which gave a survival rate of 28.6%. Cleft palate was the only gross malformation noted in the methyl parathion treated group. This malformation had a higher incidence when the pregnant mice were injected at the period of embryonal organogenesis. While injection with the other insecticides did kill some of the fetuses, the weight of the surviving fetuses was not affected.

76-0159. Lutz-Ostertag, Y.; Henou, C. (Lab. Biol. Anim. Univ. Clermont, Aubiere, France). **Paraquat: mortalite embryonnaire et effets sur l'appareil pulmonaire de l'embryon de Poulet et de Caille.** [**Paraquat: embryonic mortality and effects on pulmonary apparatus of chicken and quail.**] *C. R. Hebd. Seances Acad. Sci. Ser. D.* 281(5,6,7,8): 439-442; 1975. (21 references) (French)

The embryonic mortality and pulmonary changes were studied in chicken (Hubbard and Rhode Island Red Male, Wyandotte White Female hybrid) and quail eggs powdered with 0.4%, 0.6%, and 0.8% paraquat powder before incubation. In Hubbard chicken embryos, the mortality rates were 23.33%, 49.94%, and 54.07% after treatment with 0.4%, 0.6%, and 0.8% powders. The corresponding figures for the hybrids were 41.86%, 40.78%, and 42.15%. The mortality rates generated by the three different concentrations in quail embryos were 20.73%, 25%, and 41.8%. Histological examinations of the embryonal lungs on the 17th day of incubation in chicken embryos, and on the 13th day in quail embryos, revealed no regression of the pulmonary mesenchyma, thickening of the subepithelial connective tissue, absence of alveolar junctions, capillaries, and atrial folds, and swelling of the cytoplasm in the lung cells. The findings indicate the high toxicity of paraquat in chicken and quail embryos.

76-0160. Truhaut, R.; Claude, J. R.; Huyen, V. N.; Warnet, J. M.; Blanc, F. (Cent. Rech. Toxicol. UER, Univ. Rene-Descartes, Paris, France). **Cancerogenese hepatique primitive chez le Rat sous l'influence d'un compose pesticide, le sulfite de chloro-2-ethyl et de (*p-tert*-butyl phenoxy) 2-methyl 1 ethyle (Aramite).** [**Primary hepatic carcinogenesis in rat by a pesticide, 2-chloroethyl 1-methyl-2-(*p-tert*-butylphenoxy)ethyl sulfite (Aramite).**] *C.R. Hebd. Seances Acad. Sci. Ser. D.* 281(9): 599-604; 1975. (10 references) (French)

The pesticide Aramite was tested for its possible hepatocarcinogenic action in male Wistar rats that were given diet containing this compound at 5 g/kg for 56 weeks. The daily Aramite uptake was estimated at 400 mg/kg of body weight. Anatomopathological examinations revealed malignant neoplastic proliferation of the hepatocytes in the hepatic parenchyma in 100% of the surviving animals. In some cases, such proliferation was found also in the bile ducts. The tumors were classified as malignant hepatoma and hepatocholangiocarcinoma. The malignant changes were accompanied by pronounced tumor cachexia. The findings indicate that Aramite should be banned from agricultural use, and that it is well suited as an experimental carcinogen.

76-0161. Meiniel, R. (Lab. Biol. Anim., Univ. Clermont, 63170 Aubiere, France). **Etude de l'action protectrice de la pralidoxime vis-a-vis des anomalies squelletiques axiales provoquees par le parathion chez l'embryon de Caille japonaise.** [**Protective action of pralidoxime against axial skeletal anomalies induced by parathion in the embryo of the Japanese quail.**] *C. R. Soc. Biol.* 168(10-12): 1315-1319; 1974. (14 references) (French)

The preventive effect of pralidoxime treatment against the teratogenic action of parathion was examined on quail embryos treated by immersion of the eggs in parathion solution or by intravitelline injection. The eggs treated by immersion were injected with 0.5, 1, and 1 mg of pralidoxime on days 1, 3, and 5 of incubation, and those treated by injection received 1 mg of pralidoxime each on days 4, 5, and 6 of incubation. The macroscopic morphological appearance of the embryos receiving parathion and pralidoxime was very different from the appearance of those treated with parathion alone, and resembled the appearance of the controls. Only an abnormal approximation of the neural arcs remained in some cases of the dual treatment. The morphological and histological appearance of the neural tube was normal; fusion of 2-3 of the 4 primary neural arcs was noted on microscopic examination in only 3 of the 12 cases studied. Histoenzymatic detection of AChE activity in the control embryos on days 8-9 of incubation revealed high activity levels, pertaining especially to the neuromuscular elements. No AChE activity was detectable in these areas in the embryos treated with parathion. Additional pralidoxime treatment once again resulted in AChE detection, although at lower levels than in controls. The findings indicate that cholinesterase and/or molecules of related structure and function play an important role in the differentiation and embryonic development of the axial organs in birds.

76-0162. Arsenault, A. L.; Gibson, M. A. (Dep. Biol., Arcadia Univ., Wolfville, Nova Scotia, Canada). **Histogenesis of the islets of Langerhans in malathion-treated chick embryos.** *Can. J. Zool.* 52(12): 1541-1544; 1974. (14 references)

A study was made of the developing islets of Langerhans in malathion-treated chick embryos in a further attempt to analyze the similarities between the malathion and insulin-induced syndromes. Treatment consisted of a single injection into the yolk mass of 0.1 ml of 2% malathion in corn oil on day 5 of incubation. Throughout the period studied, the histology and staining affinities of the islet tissue in the treated pancreas were similar to those described for the untreated tissues. However, striking differences were noted in the amount of islet tissue present. On incubation day 11, the beta tissue comprised 7.82% of the pancreas and increased to 21.72% on day 17. As compared with the beta tissue in untreated pancreas, the amount of beta tissue in malathion treated pancreas was significantly increased on incubation days 13, 15, and 17. Although this increase is most obvious in the splenic and third lobes, it also occurs in the dorsal and ventral lobes. There is also a significant increase in the amount of alpha tissue tissue on days 13 and 15 of incubation which occurs in the splenic and third lobes only. The increase in beta tissue is interpreted as an increased production and release of insulin, brought about by the malathion treatment. Thus, it is suggested that it is the increased insulin which interferes with the formation of the tibiotarsus rather than the malathion itself. If this suggestion is true, it would explain the many similarities which exist between the insulin-induced and malathion-induced syndromes.

76-0163. Quarles, J. M.; Tannant, R. W. (Univ. Tennessee, Oak Ridge Grad. Sch. Biomed. Sci., Oak Ridge, TN 37830). **Effects of nitrosocarbaryl on BALB/3T3 cells.** *Cancer Res.* 35(10): 2637-2645; 1975. (33 references)

Carbaryl (*N*-methyl-1-naphthylcarbamate) and its nitrosated products *N*-nitrosocarbaryl, were tested for their effects on BALB/3T3 (clone A31) cells in culture. Nitrosocarbaryl (20 μg/ml), but not carbaryl (1-20 μg/ml), caused transformation of the BALB/3T3 fibroblasts, but neither agent induced the complete expression of endogenous murine leukemia virus. The transformed cell differed from the parental control cells with respect to a loss of contact inhibition, change in morphology, growth in soft agar, growth to higher saturation densities, and tumorigenicity in normal newborn and irradiated weanling mice and athymic (nude) mice. The transformed clones were negative for the expression of RNA tumor virus antigen, viral reverse transcriptase, and infectious virus. Thus, it appears that nitrosocarbaryl can transform BALB/3T3 cells to tumorigenic cells with altered biological properties but without complete activation of RNA tumor viruses in the transformed cells. Expression of viral antigen in the transformed cells was inducible by iododeoxyuridine, indicating that the endogenous viral genome was retained in an unexpected state.

76-0164. Peraino, C.; Fry, R. J. M.; Staffeldt, E.; Christopher, J. P. (Div. Biol. Med. Res., Argonne Natl. Lab., Argonne, IL 60439). **Comparative enhancing effects of phenobarbital, amobarbital, diphenylhydantoin, and dichlorodiphenyltrichloroethane on 2-acetylaminofluorene-induced hepatic tumorigenesis in the rat.** *Cancer Res.* 35(10): 2884-2890; 1975. (45 references)

The effects of dietary (0.05%) amobarbital, phenobarbital, diphenylhydantoin, and DDT on 2-acetylaminofluorene(AAF)-induced hepatic tumorigenesis were studied in male Sprague-Dawley rats. At 22 days of age, they were started on a diet containing 0.02% AAF; after 18 days, they were put on a control diet; then 7 days later they were started on the phenobarbital, amobarbital, DDT, and diphenylhydantoin diets. DDT and phenobarbital enhanced AAF-induced hepatic tumorigenesis to a similar extent; amobarbital and diphenylhydantoin had no such effect. In addition, both DDT and phenobarbital stimulated liver DNA synthesis and increased liver weight; again, amobarbital and diphenylhydantoin had no such effect. Phenobarbital and DDT increased the early tumor incidence rate and maintained an increment in tumor incidence over that in the other treatment groups throughout the experiment (450 days). Both agents selectively increased the incidence of highly differentiated tumors.

76-0165. Yoshida, T.; Homma, K.; Suzuki, Y.; Uchiyama, M. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Effect of fenitrothion on hepatic microsomal components of drug metabolizing system in mice.** *Chem. Pharm. Bull.* 23(9): 2155-2157; 1975. (7 references)

Male ddY mice were injected i.p. with fenitrothion (50-200 mg/kg) in corn oil or with the vehicle alone, and were killed 2-4 hr later. The animals had been pretreated for 2 days with sodium phenobarbital (80 mg/kg, i.p.). The microsomal NADPH-cytochrome c reductase activity, cytochrome P-450 content, and protein concentration were measured. The microsomal P-450 content was lowered in the fenitrothion-treated mice, the magnitude of the effect being somewhat dose-dependent. NADPH-cytochrome c reductase activity was reduced slightly by pesticide treatment, while the *N*-demethylation of aminopyrine was decreased significantly. Phenobarbital treatment augmented the fenitrothion-induced decrease in cytochrome P-450. The results suggest that the inhibition of drug metabolizing enzyme activity by fenitrothion was caused by the decrease in cytochrome P-450.

76-0166. Suzuki, T.; Uchiyama, M. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Photoreduction of parathion by spinach chloroplasts.** *Chem. Pharm. Bull.* 23(9): 2175-2178; 1975. (11 references)

Once-washed spinach chloroplasts were incubated under illuminated, anaerobic conditions with ferredoxin, Tris-HCl buffer, and parathion (0.1 mol/3 ml). The reaction mixture was then shaken and centrifuged with *n*-hexane and Tollens' reagent, and the *n*-hexane phase, containing the parathion and its reduction products, was analyzed by flame thermionic detection gas-liquid chromatography. The results indicated that hydroxylaminoparathion was the major photoreduction product of parathion and that aminoparathion was a minor product. Illumination and the presence of ferredoxin were required for the photochemical reaction, and under aerobic conditions only a small amount of hydroxylaminoparathion was formed. The addition of NADP+ to the reaction mixture strongly inhibited the photoreduction of parathion; *p*-hydroxymercuribenzoate (.10 μM) inhibited this effect of NADP+, indicating that ferredoxin-NADP+ reductase is not involved in parathion photoreduction. Nitrile reductase was similarly shown not to participate in parathion photoreduction. PMS and FMN both inhibited the photochemical reaction, probably because of their acceptance of electrons from the primary electron acceptor of photosystem I. Mild heating of the chloroplasts destroyed their ability to reduce parathion, but the addition of 2,6-dichlorophenylindophenol and ascorbate restored it.

76-0167. Khanna, F. N.; Hasan, M. Z.; Kohli, J. D. (Ind. Toxicol. Res. Cent., Mahatma Gandhi Marg, Lucknow, India). **Effect of dermal application of fenitrothion on tissue levels of copper, zinc, and manganese in rats.** *Chemosphere* 4(5): 259-264; 1975. (9 references)

Adult male albino rats were treated with a single LD50 dose of fenitrothion (750 mg/kg) applied over a 2 X 2 cm area of shaved back skin. These animals and untreated controls were sacrificed 8 hr later and the blood and tissue levels of zinc, copper, and manganese were determined. Fenitrothion resulted in a water loss from the kidney, brain, and heart, but caused no decrease in the volatile weight or ash content of these organs. The ash content in the hearts of the fenitrothion-treated rats was, in fact, increased, as were the volatile weights and/or ash contents of the liver and spleen. The copper concentrations in the brain and heart were significantly decreased in the fenitrothion-treated animals, as were the zinc concentrations in the spleen and brain, while the manganese concentration in the plasma was increased (as expressed on a μg/mg basis). The total amount of copper in the brain and spleen; the total zinc concentration in the liver, spleen, and heart; and the total manganese concentration in the spleen were significantly increased after fenitrothion treatment.

76-0168. Nikandrov, V. N. (Belorussian Sci. Res. Inst. Vet. Med., USSR). **Izmeneniya aktivnosti malatdegidrogenazy tkanyakh krys, vyzvanny vvedeniem galoid-zameshchennykh aromaticheskikh oksikislot. [Changes in the malate dehydrogenase activity in the tissues of rats after the introduction of halogen-substituted aromatic oxy acids.]** *Dokl. Akad. Nauk USSR* 19(9): 840-843; 1975. (14 references) (Russian)

The dynamics of the changes in the malate dehydrogenase activity in the blood serum, brain, liver, and muscles was studied in Wistar rats poisoned with daily 10, 5, and 1 mg/kg-doses of 2,4-D ammonium salt and 2-methyl-4-chlorophenoxy-γ-butyrate (2M-4CM) orally for 6 months. Administered in 10 mg/kg doses for 1 month, 2,4-D ammonium salt increased the malate dehydrogenase activity in the blood serum without changing the overall enzyme activity in the tissues. The specific activity in the muscles was 2.77 μmole pyruvate per g against a control level of 2.15 μmole. Redistribution of the activity between the free and conjugated forms of malate dehydrogenase was observed in the brain after six months. The activity of free and total malate dehydrogenase in the muscles was 3.08 μmole and 3.00 μmole, against the control values of 1.92 and 1.99 μmole. Similar changes were observed in the liver and in animals poisoned with 1 mg/kg doses. Administered in 10 mg/kg doses for 1 month, 2M-4CM suppressed the malate dehydrogenase activity in the tissues. The activity remained inhibited in the soluble fraction of the cells for 6 months, while the activity of conjugated malate dehydrogenase increased in the liver and muscles. The activity in the serum decreased. Poisoning with 5 mg/kg doses for 1 month activated the enzyme in the blood serum and in the tissues, but it caused no change in the activity of conjugated malate dehydrogenase as compared with the control. In the muscular tissue, the total malate dehydrogenase specific activity was lower than that of free malate dehydrogenase, which is most probably due to change in the catalytic activity of the enzyme. Similar changes were also observed in animals poisoned with 1 mg/kg doses for 6 months.

76-0169. Nikol'skiy, B. P.; Valiotti, A. B.; Nikol'skaya, E. B. (A. A. Zhdanov Leningrad State Univ., USSR).

Izuchenie teplovoy inaktivatsii atsetilkholinesterazy eritrotsitov cheloveka metodom kineticheskogo analiza. [Study of the thermal inactivation of human erythrocyte acetylcholinesterase by kinetic analysis.] *Dokl. Akad. Nauk SSSR* 224(4): 971-973; 1975. (7 references) (Russian)

The effect of inactivation at 45°C on different parameters of human erythrocyte acetylcholinesterase was studied. Thermal inactivation caused a decrease in the constants V and V', and an increase in the constants Km and Km'. Inactivation caused no shift in the maximum of acetylcholine hydrolysis rate. The thermal inactivation did not influence the value of the inhibition constant, as determined in experiments with tetramethylammonium bromide. The reduction of constant V was due primarily to a reduction of the concentration of the active centers. Increase in the activation energy was observed in the process of the thermal inactivation.

76-0170. Statham, C. N.; Pepple, S. K.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233). **Biliary excretion products of 1-(1-^{14}C)naphthyl-*N*-methylcarbamate (carbaryl) in rainbow trout (*Salmo gairdneri*).** *Drug Metab. Dispos.* 3(5): 400-406; 1975. (27 references)

Rainbow trout (*Salmo gairdneri*) were exposed under static laboratory conditions to ^{14}C-carbaryl (100 μCi/13.75 mg) at a concentration of 0.25 mg/liter water. After 24 hr, the animals were killed and the gallbladder bile was analyzed for pesticide metabolites by thin-layer chromatography, fluorescent and infrared spectroscopy, and mass spectrometry. The quantity of ^{14}C compounds recovered in the bile represented 30% of the total label taken up by the fish and 6% of the total pesticide added to the experimental tanks. A high degree of biliary concentration was indicated by a 24-hr bile to water ^{14}C ratio of nearly 1000:1. Four ^{14}C-labeled compounds were purified from the bile, two having been identified with reasonable certainty as unchanged carbaryl and 1-naphthol glucuronide. 5,6-Dihydro -5,6-dihydroxy -1-naphthyl -*N*-methyl carbamate was also tentatively identified by thin-layer chromatography. The results indicate that carbaryl can be metabolized in rainbow trout via pathways similar to those reported in mammals and that bile analysis may be helpful in monitoring fish for exposure to this compound.

76-0171. Schulze, H.; Treichler, J. (Inst. Wildtierforsch. Ahnsen in Hannover, Hanover, Germany). **Modellversuche an Fasanen mit je 1 Insektizid (Lindan), 1 Herbizid (Terbutryn), 1 Mineralduenger (Kalkammonsalpeter) und 1 Fungizid (HCB). I. Mitteilung (Terbutryn - Igran 50). [Model experiments on pheasants with one insecticide (lindane), one herbicide (terbutryne), one mineral fertilizer (calcium ammonium nitrate), and one fungicide (HCB). Note I. terbutryne - Igran 50.]** *Dtsch. Tieraerztl. Wschr.* 82(2): 75-80; 1975. (17 references) (German)

The effect of terbutryne on the vitamin A content in the liver of pheasants (*Phasianus colchicus colchicus* L.) was studied. One hundred forty 10-18 week old pheasants were fed grains treated with terbutryne ad libitum for 4 to 20 days. A significant decrease in the vitamin A content of the liver was observed starting from the 20th day, and reaching 56% of the initial level by 2 weeks after treatment. The reduction of the liver vitamin A level is indicative of the harmful effect of terbutryne.

76-0172. Barham, S. S. (Univ. Texas Grad. Sch. Biomed. Sci., Galveston, TX). **The effects of rotenone and related respiratory inhibitors on the mitotic process of mammalian cells in vitro.** *Diss. Abstr. Int.* 36(4): 1542B; 1975.

Rotenone has been used as a pesticide and in the laboratory as a specific inhibitor of the mitochondrial respiratory chain, and has proven an effective antimitotic agent in mammalian cell cultures. Addition of rotenone to a Chinese hamster ovary (CHO) cell population in exponential growth phase in vitro led to a significant increase in the mitotic index. The mitotic index of CHO cell populations exposed to rotenone (1.2×10^{-5} M) was similar to that produced by colcemid (1.5×10^{-7} M), an antimitotic agent that binds specifically to tubulin, the mitotic spindle protein. CHO cells treated with rotenone were slowed in their progression through G_2 phase. This resulted in a slightly reduced rate of accumulation of cells in mitosis by rotenone when compared to colcemid. When cells were washed free of either rotenone or colcemid, mitosis was resumed and the cells progressed into G_1 phase at approximately the same rate. Light and electron microscopic examination of rotenone treated cells revealed that the chromosome, spindle, and centriole configurations were essentially identical to those of cells arrested with colcemid. The chromosomes were usually grouped in a spherical mass near the cell center. The centrioles failed to migrate to opposite positions in the cell, an event that appears to depend upon interpolar spindle fiber formation. Mitotic spindle fibers were observed in limited numbers near the chromosome kinetochores and the centrioles. The outer portions of the cell cytoplasm were devoid of microtubules. Rotenone inhibited bovine brain microtubule assembly *in vitro* and inhibited the binding of ^{3}H-colchicine to tubulin, the microtubule protein. Colchicine binding is considered to be specific for tubulin. Rotenone also prevented assembly of microtubules from purified brain extracts of tubulin as measured by viscometry. The possibility that rotenone may also block an energy requiring step in mitosis does not conflict with the data obtained, but spindle microtubule assembly inhibition seems to be the primary effect. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-21,891.)

76-0173. Koenig, C. C. (Florida State Univ., Tallahassee, FL 32306). **The effects of DDT and mirex alone and in combination on the reproduction of a salt marsh cyprinodont fish, *Adinia xenica*.** *Diss. Abstr. Int.* 36(4): 1549B; 1975.

The organochlorine pesticides DDT and mirex are common contaminants of both fresh and salt water fishes in the U.S. DDT is known to adversely affect fish reproduction mainly by concentrating in fish eggs via the parent. This paper describes the early development of an estuarine cyprinodontid fish, *Adinia xenica*, and evaluates the im-

pact of DDT and mirex alone and in combination on these developmental and adult stages. Sublethal levels of mirex (1-3% of the larval LD50 of mirex alone) fed to parental females synergized the toxicity of DDT to larvae. Mirex significantly ($p < .05$) increased the toxicity of DDT over the range of effective doses by a factor of 1.5. The DDT LD50 of embryos and larvae corresponds to an average egg concentration of 10.8 ppm. The DDT:mirex combination LD50 of embryos and larvae corresponds to an average egg concentration of 7.56 ppm DDT plus 2.48 ppm mirex. A possible mechanism is suggested for the synergistic interaction based on changes in rates of sequestration of DDT in the larvae. A dosage level of mirex similar to that which synergized DDT toxicity in the larvae had no significant influence on DDT toxicity to adults. It is concluded that the synergistic interaction is probably occurring in all areas where significant concentrations of DDT and mirex exist. Various aspects of a local DDT-contaminated salt marsh are discussed. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 75-21,423.)

76-0174. Henderson, C. M. (Louisiana State Univ., Agr. Mech. Coll., Baton Rouge, LA.). **The in vitro inhibition of NAD-linked dehydrogenases by halogenated hydrocarbon pesticides: a proposed mechanism using lactic acid dehydrogenase as a model system.** *Diss. Abstr. Int.* 36(4): 1865B-1866B; 1975.

Effects of DDT, dieldrin, and mirex on lactate dehydrogenase (LDH) were followed via spectrophotometrically observing the decline of NADH concentration in a pyruvate reduction test system. These and other related pesticides competitively inhibited LDH with apparent inhibition constants of 0.01-0.05 m*M*. The degree of inhibition increased upon aging of NADH-pesticide mixtures; thus a time-dependent association occurs between NADH and pesticide, decreasing NADH availability for enzymatic reaction. The ultraviolet absorbance of adenine-pesticide and nicotinamide-pesticide mixtures was strictly additive, indicating lack of complex formation. In the case of NAD-pesticide and NADH-pesticide mixtures, absorbance was quenched by DDT and enhanced by mirex and dieldrin, indicating weak association of dinucleotide and pesticide. When germinating soybeans were incubated with ^{14}C-DDT and ^{14}C-dieldrin no label uptake was noted in the soluble protein fraction (by centrifugation) containing the LDH, and there was no decrease in the activity of LDH from that fraction. However, a decrease in concentration of soluble protein occurred proportional to the increase in pesticide exposure level, indicating an effect at the level of enzyme production. A proposed mechanism for the inhibition of LDH by polychlorinated pesticides includes association of NADH and pesticide and binding of pesticide within the adenosine-binding pocket of LDH. Similar considerations apply to other enzymes. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-22,210).

76-0175. Atkins, E. L.; MacDonald, R. L.; Greywood-Hale, E. A. (Dept. Entomol., Univ. California, Riverside, CA 92502). **Repellent additives to reduce pesticide hazards to honey bees: field tests.** *Environ. Entomol.* 4(2): 207-211; 1975. (7 references)

Twelve chemicals were tested in the field to determine their ability to repel *Apis mellifera* L. from agricultural crops. Three of the chemicals were too phytotoxic to seed alfalfa and cotton foliage for further consideration as repellents. One chemical crystallized when sprayed on foliage and needs to have the formulation modified. Eight chemicals provided slight to moderate repellence of bees for somewhat short periods of time. One of these, decylamine, when applied to alfalfa in bloom at a rate of 1 lb in 10 gal water/A (1.12 kg in 112 liters water/ha) provided a 69.6% average level of repellence of bees for 5.5 hr. Another, Rutgers 6-12, when applied to broccoli in bloom at the rate of 1 lb in 10 gal water/A (1.12kg in 112 liters water/ha) provided an average level of repellence of 42% for 7.8 hr. These 2 merit further consideration as potential honey bee field crop repellents. Chemical structures reveal that the most promising repellents contain benzyl, phenyl, or tolyl derivatives variously substituted with short length carbon chains. Some contain amide derivatives and several possess thymol-like odors. (Author abstract by permission)

76-0176. Glukhova, L. G. (Dep. Pharmacol., Ternopol Med. Inst., USSR). **Vliyanie polikhlropinena na zhelcheobrazovatel'nuyu funktsiyu pecheni. [Action of polychloropinene on the biligenic function of the liver.]** *Farmakol. Toksikol. (Moscow)* 37(6): 699-701; 1974. (9 references) (Russian)

The effect of single and 5-105 daily doses of polychloropinene (1/2 to 1/50 of LD50) on the biligenic function of the liver was studied in albino rats. Sharp decrease in the intensity of bile secretion from 3.9-4.3 mg/min/100 to 0.5-0.5 mg/min/100 was observed after the administration of a single 1/2 of LD50 dose of polychloropinene. Smaller doses caused moderate inhibition of the bile secretion, while 1/50 of LD50 had no effect at all. Polychloropinene caused sharp decrease in the bile acid concentration in the bile (14-31 mg% in animals treated with a single 1/2 of LD50 dose against 878-1,239 mg% in the control group). The inhibition of cholate synthesis involved the stage of primary bile acid synthesis from cholesterol, and of the conjugation of cholic acid with taurine and glycine. Polychloropinene also inhibited the excretion of cholesterol in bile, and interfered with its stabilizing effect.

76-0177. Graham, S. L.; Davis, K. J.; Hansen, W. H.; Graham, C. H. (Bur. Foods, Food Drug Adm., Dep. Health, Education, and Welfare, Washington, DC 20204). **Effects of prolonged ethylene thiourea ingestion on the thyroid of the rat.** *Food Cosmet. Toxicol.* 13(5): 493-499; 1975. (7 references)

Male and female Charles River rats, approximately 5 wk old, were fed ethylene thiourea (ETU) for 2 yr at levels of 0, 5, 25, 125, 250 or 500 ppm in the diet. Body weight, the weights of the thyroid and other organs, thyroidal uptake of ^{131}I, hematology and histology were the criteria studied. ETU was found to be a thyroid carcinogen for the rat at the 250 and 500 ppm dietary levels

and a thyroid tumorigen at the 125 ppm level; it caused slight thyroid hyperplasia at the 5 and 25 ppm feeding levels. Thyroid hyperplasia was not noticeably reversible in those rats in each group that were changed to control diet after 66 wk on ETU diets. ETU ingestion at the 5 and 25 ppm levels was not biologically deleterious to the rat. (Author abstract by permission)

76-0178. Allen, J. R.; Van Miller, J. P.; Norback, D. H. (Dep. Pathol., Univ. Wisconsin Med. Sch., Madison, WI 53706). **Tissue distribution, excretion and biological effects of [^{14}C]tetrachlorodibenzo-*p*-dioxin in rats.** *Food Cosmet Toxicol.* 13(5): 501-505; 1975. (20 references)

When Sprague-Dawley rats weighing 200 g were intubated intragastrically with ^{14}C-labeled 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in a dose of 50 μg/kg body weight, 50% of the animals died within 25 days. Over 56% of the radioactivity was eliminated, mainly by the alimentary route, during the initial 21 days, 25% being accounted for during the first 3 days. The total amount of radioactivity in the urine was 45% of the total dose, the highest daily levels being excreted toward the end of the experiment. A large percentage of the radioactivity remaining in the body was localized in the liver and of this, over 90% was within the microsomal fraction. The major morphological changes in the rats were a marked liver hypertrophy and thymic regression. (Author abstract by permission)

76-0179. Imai, H.; Miyamoto, M.; Ishikawa, S. (Sch. Ophthalmol., Kitasato Univ., Sagamihara, Kanagawa, Japan). [**Experimental degeneration of the retina by fenthion.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 69(10): 1267; 1975. (Japanese)

In clinical cases of chronic organophosphorus intoxication, a decrease in the amplitude and a protraction of the ERG wave time values were observed but no abnormalities were found in the eye fundus. These symptoms were alleviated by the administration of PAM (pralidoxime). To determine whether any functional or organic change in the retina remained, 50 mg fenthion/kg was administered once per week to Wistar rats. It was found that ERG changes occurred after 60 days and histological changes were found in the fundus after 4 months.

76-0180. Takeda, S.; Tsukahara, I.; Takemoto, I.; Takaori, S. (Kansai Med. Coll., Japan). [**Antagonistic action of glutathione on action of organophosphorus pesticides on the central optic pathways.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 69(10): 1280; 1975. (Japanese)

Chlorfenvinphos was administered to cats at 4 mg/kg, i.p. The cat's ERG was amplified while the induced potential of the optic nerve and of the lateral geniculate carpus was, in time, reduced in amplitude. The induced potential of the optic area of the cerebral cortex showed no consistent change resulting from treatment. When the cats were treated with glutathione before administration of chlorfenvinphos, the above-mentioned effects were inhibited. The mechanism of the antagonism between chlorfenvinphos and glutathione was discussed.

76-0181. Bringmann, G.; Kuehn, R. (Author address not given). **Wirkung herbizider Phenylharnstoff-Derivate gegen Blaualgen (Modellorganismen: *Microcystis aeruginosa* bzw. *Nostoc* spec.)** [**The effect of herbicidal phenylurea derivatives on blue algae (model organisms: *Microcystis aeruginosa* and *Nostoc* sp.).**] *Gas- Wasserfach Wasser-Abwasser* 116(8): 366-369; 1975. (German)

The effect of 12 phenylurea-derived herbicides on the blue algae *Microcystis aeruginosa* and *Nostoc* sp. was studied by Bringmann's inhibition test. The lowest herbicide concentrations causing an initial inhibition of the cell proliferation of *M. aeruginosa* were (in μg/liter) 1.1 for diuron, 2 for chlorbromuron, 2.4 for neburon and chloroxuron, 23 for monuron, 35 for fluometuron, 39 for benzthiazuron, 42 for methabenzthiazuron, 80 for metobromuron, 137 for monolinuron, 175 for buturon, and 250 for cycluron. The corresponding concentrations for *Nostoc* sp. were 10.8 for diuron, 32.1 for chloroxuron, 35 for neburon, 36 for chlorbromuron, 170 for monuron, 215 for buturon, 260 for monolinuron, 290 for metobromuron, 450 for benzthiazuron, 495 for methabenzthiazuron, 550 for fluometuron, and 1,200 for cycluron. Nontoxic concentrations of all herbicides stimulated cell proliferation in *Nostoc* sp. Phenylurea derivatives with dichlorophenyl, bromochlorophenyl, and chlorophenoxyphenyl components were the strongest inhibitors, and a herbicide with cyclooctyl group was the weakest inhibitor. Among the herbicides with chlorophenyl components, the dimethylurea derivatives were more toxic than methoxymethylurea and methylisobutinylurea derivatives. The blue alga *M. aeruginosa* is especially suitable as a test organism for phenylurea derivatives.

76-0182. Kuz'menko, N. M. (All-Union Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastics, Kiev, USSR). **Nekotorye svedeniya o gerbitside dalapone.** [**Dalapon herbicide.**] *Gig. Primen., Toksikol. Pestits. Klin. Otravlenii* 8: 368-371; 1970. (Russian)

The percutaneous and the acute and chronic oral toxicity of dalapon was studied in albino mice and rats. The acute oral LD50 was determined to be 3.65 ± 0.22 g/kg in mice and 9.24 ± 0.7 g/kg in rats. General depression of the central nervous system, reduced excitation level, paresis of the limbs, and death due to asphyxiation were observed. Percutaneously applied doses of up to 20 g/kg caused neither poisoning symptoms nor local irritation. Moderate hyperemia was caused by dalapon in the conjunctiva of the eyes. Chronic poisoning with 1/5, 1/10, and 1/20 of LD50 for 2 months revealed no cumulative effect of the pesticide. Temporary depression and loss of appetite and weight were observed during the experiment. Considerable reduction of the physical performance of the animals was observed at the end of the experiment. The findings indicate the low toxicity of dalapon.

76-0183. Kovtun, S. D.; Kokshareva, N. V.; Kondratenko, T. I.; Kurinnyy, A. I. (All-Union Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastics, Kiev, USSR). **Issledovanie toksicheskikh i tsitogeneticheskikh svoystv repellenta benzimina.** [**Toxic and cytogenetic properties of the repellent benzimine.**] *Gig. Primen., Toksikol. Pestits. Klin. Otravlenii* 8: 407-414; 1970. (Russian)

The general toxic and cytotoxic action of the repel-

lent benzimine was studied in albino mice, rats, and rabbits. The LD50 of technical-grade benzimine was determined to be 1,120 mg/kg in mice and 1,160 mg/kg in rats, while the corresponding LD50 for purified benzimine in rats is 3,000 mg/kg. Short-term excitation, motor coordination troubles, respiratory arrhythmia, tremor, convulsions, and sleep were the principal symptoms of the acute oral poisoning. Benzimine, administered in a dose equaling 50% of LD50 to rats, caused labile states of stimulation and inhibition of the central nervous system. Reduction of the leukocyte and thrombocyte counts, tendency toward reduced hemoglobin level and erythrocyte count, and prolonged prothrombin time were found in the peripheral blood. Similar application and biochemical findings were obtained for rabbits after skin application of benzimine. Erythema and subsequent desquamation were the local skin reactions to benzimine. Oral doses of 300 to 900 mg/kg and percutaneously applied benzimine failed to cause significant change in the frequency of chromosomal aberrations in the bone marrow.

76-0184. Sokur, A. I. (Author address not given). **Gipokalemiya, nastupayushchaya v eritrotsitakh pri intoksikatsii belykh krys nekotorymi pestitsidami (DDT, sevinom, khlorofosom).** [**Hypokalemia in erythrocytes during the poisoning of rats with pesticides (DDT, sevin, chlorophos).**] *Gig. Primen. Toksikol. Pestits. Klin. Otravlenii* 9: *213-216; 1971.*

The effect of DDT, carbaryl, and trichlorfon on the potassium ion concentration in the erythrocytes and on the hematocrit value was studied in albino rats poisoned with 1-20 of LD50 of these pesticides for 2 months. The total doses administered orally amounted to 1,250 mg-kg for DDT, to 2,100 mg-kg for carbaryl, and to 2,000 mg-kg for trichlorfon. By the end of the first month of poisoning, DDT, carbaryl, and trichlorfon reduced the potassium ion concentration in the erythrocytes by 25.5%, 26.1%, and 27.4%, respectively. The corresponding reductions measured at the end of the second month were 27.3%, 24.1%, and 32.9%. Against an initial hematocrit value of 43.5%, values of 38.9%, 37.5%, and 38% were measured in rats poisoned with DDT, carbaryl, and trichlorfon for one month. These levels remained the same during the further course of the experiment.

76-0185. Gofmekler, V. A. (Vladivostok Med. Inst., USSR). **Embriotropnoe deystvie khimicheskikh zagryazneniy atmosfernogo vozdukha.** [**Embryotropic action of chemical atmospheric pollution.**] *Gig. Sanit.* 39(9): 7-10; 1974. (25 references) (Russian)

The embryotropic action of benzene, formaldehyde, dimethylformamide, diethylamine, hexane, chloroprene, methylmercaptophos, trichlorfon, and butyphos as air pollutants was studied in pregnant albino rats and their offspring. The pregnant rats were exposed to these substances continuously throughout pregnancy. The different chemical substances tested caused nonspecific embryotropic and other effects on the animals, such as reduced fertility, increased rate of intrauterine death, changes in the size and weight of the fetuses, biochemical changes in the maternal and fetal organisms and in the placenta, and embryonal malformations, even when inhaled in concentrations substantially below the average maximum permissible concentration as suggested previously. While methylmercaptophos increased the fertility by 9%, butyphos and trichlorfon reduced their parameter by 19% and 17%, respectively. Methylmercaptophos and trichlorfon reduced the fetal weight by 12% and 7%. Butyphos and trichlorfon reduced the weight of the lungs and liver of the fetuses, while methylmercaptophos caused a 9% increase.

76-0186. Gorbachevskaya, E. F. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Autoimmunnye protsessy v patogeneze intoksikatsii organizma zhivotnykh gammageksakhlortsiklogeksana i dikhlordifeniltrikhloretana.** [**Autoimmune processes in the pathogenesis of poisonings with lindane and DDT in animals.**] *Gig. Sanit.* 40 (5): 110; 1975. (Russian)

Autoimmune processes involved in the pathogenesis of poisoning with DDT and lindane were studied in lymphocyte and hepatocyte cultures from female Chinchilla rabbits that had been treated with daily 10 mg/kg doses of DDT and 4 mg/kg doses of lindane for 4 months before they were mated with intact males. Poisoning with lindane or DDT before mating rendered the immune lymphocytes of these females aggressive towards their own hepatocytes, as well as towards hepatocytes of newborn rabbits and intact adult control rabbits.

76-0187. Doroshenko, G. V.; Chernov, I. P. (I. P. Pavlov Ryazan Med. Inst., USSR). **Vliyanie kompleksa pestitsidov na soderzhanie askorbinovoy kisloty v nadpochechnikakh belykh krys.** [**Effect of combinations of pesticides on the vitamin C level in the adrenal glands of albino rats.**] *Gig. Sanit.* 40(5):111; 1975. (Russian)

The effects of different combinations of orally administered pesticides on the total, oxidized and reduced ascorbic acid contents of the adrenal glands were studied in albino rats in a six-month experiment. Group 1 was given 1/100 of LD50 of a combination of carbophos (malathion), zineb, and ether sulfonate (ovex). Group 2 received 1/30 doses daily, while group 3 received the same doses for 10 days each at 10-day intervals. Groups 4 and 5 received 1/30 of LD50 of the above pesticides after treatment with 1/50 of LD50 doses of DNOC or nitrofen. Significant reduction of the total and oxidized ascorbic acid levels was observed in groups 2, 3, and 4 after three months. The six-month poisoning resulted in no changes in the different forms of ascorbic acid in group 1. Significant reduction of all forms of ascorbic acid was observed in groups 2 and 4 at the end of the six month experiment. Increase in the total and oxidized ascorbic acid levels and reduction of the reduced ascorbic acid levels were observed in group 3. Tendency toward reduced ascorbic acid level was observed in group 5 after pretreatment with nitrofen.

76-0188. Gabovich, R. D.; Murashko, V. A.; Timoshenko, Ya. G. (Kiev Med. Inst., Kiev, USSR). **Ustoychivost' organizma k geksakhlorbenzolu pri razlichnykh sochetaniyakh temperatury vozdukha i UF-oblucheniya.** [**The body resistance to hexachlorobenzene in different**

combinations of air temperature and UV-radiation.] *Gig. Sanit.* 40(8):17-21; 1975. (Russian)

The effect of high air temperatures (34-36°C), low and high levels of UV radiation (35 and 2,000 mcer/cm²) on the toxicity of BHC dust in the air (50 mg/m³, exposure for 4 hr daily) was studied in albino rats. While an optimal UV dose of 400 mcer/cm² reduced the toxicity of the animals to BHC, the low and high UV doses, either alone or in combination, reduced the resistance of the organism to BHC by diminishing the activity of liver tissue cholinesterase and increasing the activity of alkaline phosphatase in the blood serum. These physical factors also increased the bromsulfalein retention coefficient in BHC poisoning. The findings can be used as a basis for prophylactic planning in connection with the application of BHC as a function of the climatic conditions.

76-0189. Yusanov, A. M. (Tadzhik Med. Inst., Dushanbe, USSR). **Toksichnoe deystvie nekotorykh pestitsidov na teplokrovnykh v usloviyakh vysokogor'ya.** [**Toxic action of some pesticides on warm-blooded animals in highlands.**] *Gig. Sanit.* 40(8): 96-97; 1975. (3 references) (Russian)

The acute and subchronic oral toxicity of BHC, lindane, dimethoate, and granosan was studied in albino mice and rats under the conditons of great altitude (3,640 m above sea level). All preparations proved to be more toxic at great altitude than in lower regions, which may be due to the aggravating effect of these pesticides on hypoxia. The LD50 of technical-grade dimethoate was 70 mg/kg in mice, against 125 mg/kg as determined for lowland conditions, and the cumulative effect was more pronounced at great altitude. The LD50 of lindane was 105 mg/kg against 119 mg/kg as determined for lowland conditions.

76-0190. Konstantinova, T. K. (Inst. Rural Hyg., Saratov, USSR). **Izuchenie vliyaniya gerbitsida butilovogo efira 2,4,5-T na potomstvo eksperimental'nykh zhivotnykh.** [**Effect of a herbicide, the butyl ester of 2,4,5-T, on the progeny of experimental animals.**] *Gig. Tr. Prof. Zabol.* 9: 29-32; 1974. (3 references) (Russian)

The effect of 2,4,5-T butyl ester on the progeny of white rats was studied. Pregnant rats received 0.42 mg/kg or 0.01 mg/kg doses of 2,4,5-T butyl ester throughout their pregnancy through stomach tube. The 0.01 mg/kg proved to be ineffective. The 0.42 mg/kg doses failed to produce any changes in the embryos, but they had an adverse effect on the growth, development, and physiological functions in the first and second generations obtained by mating offspring from experimental females with similar animals or with animals from control parents. Growth retardation, reduced rate of gain in weight, increased stillbirth rate, reduced litter size, reduced neutrophil count, increased excitability of the nervous system, reduced detoxifying activity of the liver, reduced rate of diuresis, reduction in the relative weight of the kidney and adrenal glands, and reduced volume of the testes were found in the first and second generations. The experimental results will be used as a basis for the elaboration of hygienic standards on 2,4,5-T butyl ester in different environmental media.

76-0191. Tsapko, V. G.; Rappoport, M. B. (Author address not given). **Strukturnye izmeneniya v organizme zhivotnykh pri kombinirovannom deystvii intensivnogo shuma i fosfororganicheskogo pestitsida khlorofosa (diptereksa).** [**Structural changes in animal organisms during the combined action of intense noise and the organophosphorus pesticide chlorophos (dipterex).**] *Gig. Tr.* 8: 128-131; 1972. (Russian)

Structural changes in the brain, endocrine glands, and parenchymatous organs of albino rats were studied under the combined action of orally administered trichlorfon (1/20 of LD50 for 80 days) and medium-frequency noise at the 106 dB level (taped noise of tractor with pesticide sprayer attachment). The structural changes were studied at 20 day intervals and compared with those found in animals exposed to either noise or trichlorfon alone. Moderate plethora, pericellular and perivascular edema, cells with central and peripheral chromatolysis, neuronophagy, and death of some ganglion cells were found in the brain at all stages of the combined exposure. Hyperemia of the posterior and anterior lobes of the pituitary gland, hyperemia and enlargement of the islets of Langerhans in the pancreas, hypofunction of the thyroid gland, hyperemia of the capillaries and sinuses, and dysfunction of the adrenal glands were observed. Death of parts of the spermatogenic epithelium was found in the testes of certain animals. The epithelium of the convoluted tubules of the kidney was swollen and enlarged. The spleen exhibited hemodynamic disorders in the form of dilated and hyperemic sinuses, and of hyperplasia of the interfollicular tissue. Focal swelling of the muscle fibers was observed in the myocardium. Emphysematous dilatation of the alveoli and hyperemia of the blood vessels was observed in the lungs throughout the experiment. The structural changes found in animals exposed to either noise or trichlorfon were similar but of considerably lower intensity.

76-0192. Hurkat, P. C.; Nath, S. (Dep. Physiol. Biochem., JLN Med. Coll., Ajmer, India). **Effect of dieldrin on reproduction in rats.** *Indian J. Physiol. Pharmacol.* 18(3): 201-202; 1974.

The effect of dieldrin on reproduction in rats was studied. Fifty rats were used for the study, 10 males and 40 females. They were given dieldrin p.o. in two dose schedules (one being mg/kg body weight) on alternate days. Control rats received only the vehicle, peanut oil. No adverse effects were noted with regard to fecundity or gestation or parturition of the young. The number of young delivered at a time varied from 6 to 10. The rearing was not altered in any way but the mortality of the litter was marked. Some discussion is given as to the cause of the increased litter mortality.

76-0193. Saxena, R. K.; Mishra, N. P.; Gupta, S. S.; Mishra, S. M. (Author address not given). **Experimental study of Tik-2 poisoning and its treatment.** *Indian J. Physiol. Pharmacol.* 18(3): 212; 1974.

The use of pyridine-2-aldoxime methochloride (2-PAM chloride, pralidoxime) in the treatment of fenitrothion (Tik-20) poisoning was studied. The LD50 of fenitrothion administered p.o. to rats was 197.50 mg/kg. Com-

bining this treatment with atropine did not significantly change the LD50, 198.6 mg/kg. However, pretreating rats with 2-PAM chloride + atropine before the signs of toxicity appeared did significantly alter the LD50, to 404.40 mg/kg. When the combined treatment was given after the appearance of toxicity signs, this protection was even more marked, as the LD50 was raised to 809.30 mg/kg. The protective effect of 2-PAM chloride and atropine in lower doses (50% of max. effective dose, 200 mg/kg) was well marked. In higher doses, 2-PAM chloride + atropine reactivation of cholinesterase was more significant, but LD50 values were not raised proportionately. The results of this study indicate that the treatment of fenitrothion poisoning with 2-PAM chloride is well substantiated.

76-0194. Starr, R. I.; Cunningham, D. J. (Wildlife Res. Cent., Federal Cent., Denver, CO 80225). **Degradation of 4-aminopyridine-^{14}C in corn and sorghum plants.** *J. Agric. Food Chem.* 23(2): 279-281; 1975. (10 references)

Acetone-soluble radiolabeled metabolites, as determined by thin-layer chromatographic procedures, were not detected in roots and shoots of young corn plants (*Zea mays*) cultured 7 days in nutrient solutions containing 20 ppm of 4-aminopyridine-^{14}C. Autoradiograms of thin-layer plates containing acetone extracts of young sorghum plants (*Sorghum vulgare*), 2 weeks after treatment, showed some degradation of the labeled compound, with three similar major metabolites detected in both roots and shoots. The majority of ^{14}C extracted from these tissues was suggested to be present as the parent chemical, or possibly as 4-aminopyridine released during hydrolysis of sugar and/or amino acid conjugates. Less radioactivity was extracted from sorghum tissues maintained 7-14 days in nutrient solutions than from those kept in cultures 1 hr to 7 days, suggesting that some of the radiolabeled parent compound was bound or incorporated into the tissues of those plants cultured the longer periods. Although these data indicate that additional studies are necessary, the work suggests that 4-aminopyridine absorbed and translocated by corn and sorghum plants is not degraded in appreciable quantities to extractable, nonconjugated products, potentially more toxic than the parent chemical. (Author abstract by permission)

76-0195. Jordan, L. S.; Zurquyah, A. A.; De Mur, A. R.; Clerx, W. A. (Standard Fruit Steamship Co., Honduras Div., New Orleans, LA). **Metabolism of siduron in Kentucky bluegrass (*Poa pratensis* L.).** *J. Agric. Food Chem.* 23(2): 286-290; 1975. (6 references)

Kentucky bluegrass "Merion" (*Poa pratensis* L.) growing in nutrient solution was treated with 1-(2-methylcyclohexyl) -3-phenylurea (siduron) and 1-(2-methylcyclohexyl) -3-phenyl -2-^{14}C-urea. Siduron and its metabolites were extracted, partitioned between chloroform and water, purified by column and thin-layer chromatography (tlc), separated by tlc, and characterized by infrared and mass spectrometry. Conjugates were hydrolyzed by enzymes. Four metabolites were isolated by tlc, three of which were characterized as 1-(*p*-hydroxyphenyl) -3-(2-methylcyclohexyl) urea, 1-(2-hydroxymethyl cyclohexyl) -3-phenylurea, and 1-(4-hydroxy -2-methylcyclohexyl) -3-phenylurea. The fourth metabolite was not identified. (Author abstract reprinted by permission of the American Chemical Society)

76-0196. Gilbert, M. D.; Monselise, S. P.; Edgarton, L. J.; Maylin, G. A.; Hicks, L. J.; Lisk, D. J. (Pestic. Res. Lab., Cornell Univ., Ithaca, NY 14853). **Metabolism studies with ethephon in cherry leaves.** *J. Agric. Food Chem.* 23(2): 290-292; 1975. (8 references)

The presence of metabolites of [^{14}C]ethephon in leaves of Montmorency cherry was indicated by thin-layer and anion exchange chromatography and autoradiography. The metabolite may contain an intact phosphonic acid group. Matrix interferences prevented its further characterization by mass spectrometry. (Author abstract by permission)

76-0197. Thalken, C. E.; Ward, W. E.; Young, A. L. (USAF Acad., CO). **Absence of TCDD toxicity to a rodent population following massive field applications of 2,4,5-T herbicide.** *J. Am. Vet. Med. Assoc.* 167(9): 861; 1975.

A one-square-mile military test site was sprayed with 160,948 lb of active ingredient 2,4,5-T herbicide. The contaminant TCDD was found in levels of 10-710 ppt in the top 6 in. of soil in this area 10 yr later. Liver tissue from rodents (*Peromyscus polionotus* and *Sigmodon hispidus*) inhabiting the test site contained 210-1,300 ppt TCDD. However, examination of 122 adults and 87 fetuses revealed no gross or histologic evidence of teratogenesis or toxicity. An analysis of variance of liver and spleen weights for the beach mouse indicated significant differences between control and TCDD-exposed animals. Analysis of plant seeds in the treated area revealed no detectable TCDD. The TCDD accumulation in the liver tissue appears to be associated with pelt contamination from burrowing and subsequent ingestion of soil particles during grooming.

76-0198. Sprecher, D. J.; Leman, A. D.; Cropper, M. (Univ. Illinois, Urbana, IL). **Effect of dichlorvos on baby pig weights and survival.** *J. Anim. Sci.* 39(5): 995; 1974.

Dichlorvos was added to the feed of sows during gestation at the rate of 1.0 g/female/day in the form of 10.4 g of ATGARD C Swine Wormer for 25 days prior to parturition. Mean birth weights for pigs farrowed by the six control gilts, 34 control sows, 10 treated gilts, and 18 treated sows were 1.43, 1.32, 1.37, and 1.45 kg, respectively. Combined mean birth weight for all pigs from control females was 1.36 kg compared to 1.42 kg from treated females. Mean 21-day weaning weights for pigs farrowed by control gilts, control sows, treated gilts, and treated sows were 3.81, 3.95, 4.28, and 4.10 kg, respectively. The combined mean 21-day weaning weight for all pigs from control females was 3.92 kg compared to 4.17 kg for treated females. The number of pigs produced and the stillbirth rate per group were: control gilts, 56 pigs, 1.78% stillbirth rate; control sows, 364 pigs, 4.12%; treated gilts, 72 pigs, 1.39%; and treated sows, 188 pigs, 0.00%. The stillbirth rate for all control groups was 3.81%, compared to 0.39% for treated groups. In control groups 88.65% of

the live-born pigs reached weaning age. The comparable value for the treated groups was 85.12%. The data from this study suggests that oral dichlorvos increases mean pig 21-day weaning weight, decreases stillbirths, and does not affect pre-weaning survival.

76-0199. Lee, B. J. (Inst. Ecol., Univ. Georgia, Athens, GA). **Effects of mirex on litter organisms and leaf decomposition in a mixed hardwood forest in Athens, Georgia.** *J. Environ. Qual.* 3(4): 305-311; 1974. (24 references)

Mirex bait was applied to oak and dogwood leaf litter in mesh bags. Macro- and microarthropods were counted. Ant presence on plots was tested by use of blank bait and molasses. Mirex in bait and spray form, and at the two levels applied, caused a significant acceleration in litter decomposition. The two leaf species showed significantly different decomposition rates. The slope of the ground surface on which the bags were placed also influenced the decomposition process. The two leaf species differed in the amount of decomposition shown with mirex treatment, dogwood being more affected than oak. Ants were essentially removed from bait and concentrated spray plots up to 79 days, but ants had returned to all plots by the 334th day after treatment. The low spray treatment had no effect on the ant populations. In macroarthropod populations, little difference was observed with treatment except with centipedes whose numbers appeared to decrease on the bait and concentrated spray plots. Microarthropod populations showed significant differences with treatment at different times during the experiment. No overall pattern could be detected. Neither the microarthropods nor the macroarthropods could account for the change in decomposition. The groups most probably affected by the mirex would be the bacteria and fungi. These were not monitored. Mirex could have accelerated decomposition through its ability to induce mixed-function oxidase systems in the microorganisms. If synthesis of more of these enzymes by fungi and/or bacteria allowed faster metabolism of the plant inhibitor, tannic acid, then decomposition could have received an early boost due to the growth of microorganisms usually limited by tannic acid. (Author abstract by permission, abridged.)

76-0200. Focht, D. D.; Joseph, H. (Dep. Soil Sci. Agric. Eng., Univ. California, Riverside, CA 92502). **Microbial activity in soils treated with acephate and monitor.** *J. Environ. Qual.* 3(4): 327-328; 1974. (9 references)

A Hanford loamy sand, a Domino silt loam, and an Altamont clay loam were treated separately with three repeated applications (20 ppm) of the organophosphate insecticides, acephate (*O,S*-dimethyl acetylphosphoramidothioate) and Monitor (*O,S*-dimethyl phosphoramidothioate) over a 50-day time span. Population levels of actinomycetes, bacteria, and fungi were not substantially affected by the addition of either pesticide. Neither could a marked effect be shown upon ammonification, nitrification, sulfur oxidation, or respiration rates. Replica plating failed to isolate bacteria from soils that were adversely affected by either pesticide. It is concluded that neither acephate nor Monitor had any adverse effect upon soil microorganisms. (Author abstract by permission)

76-0201. Farnell, D. R.; Futrell, M. C.; Watson, V. H.; Poe, W. E.; Coats, R. E. (Dep. Comp. Med., Coll. Med., Univ. South Alabama, Mobile, AL 36688). **Field studies on etiology and control of fescue toxicosis.** *J. Environ. Qual.* 4(1): 120-122; 1975. (5 references)

An outbreak of fescue toxicosis occurred in cattle in the southern part of Mississippi in 1969-70. A survey of veterinarians and county agents revealed that fescue toxicosis occurred in 15 Mississippi counties, with general distribution across the state. Field investigations were conducted to gain additional information on the role of fungi in the etiology of fescue toxicosis and to determine if an antifungal agent would be beneficial in controlling the disease. Thiabendazole [2-(4-thiazolyl) -benzimidazole], a drug with known anthelmintic and antifungal properties, was found to be of benefit in preventing symptoms of fescue toxicosis when administered periodically to cattle before and during grazing on known toxic fescue pastures. Thiabendazole was effective when administered orally immediately before the animals were put on toxic fescue and at 7-day intervals at a dosage of 5.0 g/45.5 kg body weight, but it was not effective at a dosage of 1.0 g/45.5 kg body weight administered in the same way. The symptoms of fescue toxicosis occurred more often after or during rainy, overcast weather. (Author abstract by permission)

76-0202. Wolf, D. C.; Martin, J. P. * (Dep. Soil Sci. Agric. Eng., Univ. California, Riverside, CA 92502). **Microbial decomposition of ring-^{14}C atrazine, cyanuric acid, and 2-chloro -4,6- diamino -*s*- triazine.** *J. Environ. Qal.* 4(1): 134-139; 1975. (33 references)

The relative degradation rates of 2.5 ppm 2-chloro -4-(ethylamino) -6-(isopropylamino) -*s*-triazine (atrazine), 2,4,6-trihydroxy -*s*-triazine (cyanuric acid), and 2-chloro -4,6-diamino-*s*-triazine were studied in Greenfield sandy loam soil and in pure culture. Only 18% of the activity from added ring-^{14}C labeled atrazine was recovered as $^{14}CO_2$ after 550 days of incubation at 60% water-holding capacity. Ring-^{14}C 2-chloro -4,6-diamino -*s*-triazine yielded 40% of the added activity as $^{14}CO_2$ during 192 days. After 16 days, 87% of the labeled cyanuric acid had evolved as $^{14}CO_2$ and after 32 days, the percentage had increased to 96%, indicating that after ring cleavage the cyanuric acid C is not used for cell synthesis by the soil organisms. Evolution of $^{14}CO_2$ from the three compounds was greatly retarded under saturated soil conditions. Losses were less than 0.6% for ring-^{14}C atrazine during 375 days, 83% for cyanuric acid in 66 days, and 22% for 2-chloro -4,6-diamino -*s*-triazine in 192 days. If cyanuric acid and 2-chloro -4,6-diamino -*s*-triazine are intermediates in atrazine degradation, their detection in soils would be difficult because they are more rapidly oxidized than atrazine. Atrazine did not affect the activity of the soil microbes as measured by total CO_2 evolution, numbers of microorganisms, or ability of soil microbes to decompose lima bean straw (*Phaseolus limensis*). Pure culture studies with two soil fungi, *Stachybotrys chartarium* and *Hendersonula toruloidea*, showed that neither was able to cleave

the *s*-triazine ring of atrazine or 2-chloro -4,6-diamino -*s*-triazine, but both could degrade cyanuric acid to CO^2. (Author abstract by permission)

76-0203. Arena, F.; Manna, F.; Pizza, C.; Stein, M. L.; Grifantini, M. (Inst. Pharm. Toxicol. Chem., Univ. Naples, Naples, Italy). **Structure-activity relationships in reactivators of organophosphorus-inhibited acetylcholinesterase. 10. Hydroxyiminomethylarylethenyl-pyridine methiodides.** *J. Med. Chem.* 18(11): 1147-1151; 1975. (20 references)

Styrylpyridine methiodides were synthesized in which a hydrogen of the pyridyl moiety was replaced by the hydroxyiminomethyl group. This replacement produced highly effective inhibitors of acetylcholinesterase. 4-Methylpyridine -2-aldoxime and 2-methylpyridine -4-aldoxime methiodides were prepared as starting materials. These 2 compounds, together with 4-imidazolylethenylpyridine -2-aldoxime methiodide, were the only substances for which some activity as reactivators of phosphorylated electric eel cholinesterase in vitro could also be found.

76-0204. Silinskas, C.; Okey, A. B. (Dep. Biol., Univ. Windsor, Windsor, Ontario, Canada). **Protection by 1,1,1-trichloro -2,2- bis(*p*-chlorophenyl) ethane (DDT) against mammary tumors and leukemia during prolonged feeding of** 7,12-dimethylbenz(a)anthracene **to female rats.** *J. Natl. Cancer Inst.* 55(3): 653-657; 1975. (37 references)

Either DDT (100 ppm) or malathion (250 ppm) was added to the diet of 36 day old female Sprague-Dawley rats for a period of 2 weeks. Via stomach tube, 21 consecutive daily doses of 0.714 mg DMBA were administered starting on day 50. Necropsy was performed 230 days after the start of DMBA administration and until this time both the pesticide diets and observation of the animals for mammary tumors continued. A significantly lower incidence of mammary tumors was noted among rats treated with DDT. These rats also showed a prolonged tumor latency period and fewer tumors/rat than did the control group. Malathion treatment resulted in a higher mammary tumor incidence, shortened latency period, more tumors/rat, and more actively growing tumors than the control group experienced. The incidence of leukemia in rats surviving to necropsy was 11/20 for controls, 2/29 for DDT, and 8/12 for malathion. The leukemia seen was primarily myelogenous. It is suggested that DDT may inhibit DMBA-induced mammary tumors and leukemia by stimulating hepatic metabolism and excretion of DMBA so that less carcinogen is available to peripheral tissues. It is also suggested that malathion may potentiate DMBA induction of mammary tumors and leukemia by inhibiting the same enzyme systems induced by DDT.

76-0205. Ueda, K.; Kawai, M. (Dep. Hyg., Tokyo Dental College, Tokyo, Japan). [**Long-term oral administration of chinoform in mice.**] *Igaku To Seibutsugaku (Med. Biol.)* 87(4): 209-212; 1973. (4 references) (Japanese)

The induction of SMON (subacute myelo-optic neuropathy) by oral administration of chinoform was studied on female ICR mice. The effect of simultaneous administration of sumithion (fenitrothion) and BHC (α:69.1%, β:9.72%, γ:15-10%, and δ;5.87%) along with chinoform on the SMON disease induction was also studied. Chinoform, sumithion, and BHC were dissolved separately in polyethylene glycol, and the polyethylene glycol solutions were mixed with market milk, which was then given to mice as their drinking water. Increasing chinoform doses of 90 to 600 mg/kg/day were used, but the sumithion and BHC doses were kept constant at 20 ppm for the 6 months experimental period. Two of the mice from the group with chinoform administration and one mouse from the group with chinoform plus sumithion administration developed SMON-like symptoms. The former two mice showed difficulty in walking by the 19th and 20th weeks; the chinoform dose in these mice was 350 to 400 mg/kg/day. Their symptoms became worse in the following weeks, and definite paralysis of the sciatic nerve was apparent. Histopathological study using an electron microscope indicated SMON-like changes in the sciatic nerve. The mouse from the chinoform plus sumithion group developed SMON-like symptoms by the 21st week. The total chinoform intake by mice at the time of development of SMON symptoms was about 1100 to 1400 mg/mouse. However, the definite cause of the observed SMON-like symptoms in the three mice could not be determined—it might have been induced by chinoform or simply by lowered resistance.

76-0206. Brestkin, A. P.; Shataeva, G. A. (I. M. Sechenov Inst. Evolutional Physiol. Biochem., Acad. Sci. USSR, Leningrad, USSR). **O vliyanii khloridov shchelochnykh i shchelochnozemel'nykh metallov na skorost' ingibirovaniya kholinesteraz fosfororganicheskimi in gibitorami.** [**Effect of alkali metal and alkaline-earth metal chlorides on the rate of inhibition of cholinesterases by organophosphorus inhibitors.**] *Izvestiya Akad. Nauk SSSR, Ser. Khim.* 7: 1538-1544; 1975. (15 references) (Russian)

The effect of chlorides of lithium, sodium, potassium, rubidium, cesium, magnesium, calcium, strontium, and barium was studied on the rate of inhibition of horse serum butyryl cholinesterase and of bull erythrocyte acetylcholinesterase by *O*-ethyl -*S*- (β-ethylmercaptoethyl) methylthiophosphonate (Gd-7) and *O* -ethyl -*S*- (β-ethylmercaptoethyl) methylsufomethylate (Gd-42). The bimolecular rate constant of the reaction between the inhibitors and butyryl and acetyl cholinesterases was determined. Increasing electrolyte concentration caused a considerable reduction in the rate constant for acetylcholinesterase and butyrylcholinesterase with Gd-42, and a considerable increase for the reaction between acetyl or butyryl cholinesterase and Gd-7. The reaction rate constant was fairly stable within an electrolyte

concentration range of $\mu = 0.0044$-0.11 for acetylcholinesterase, and it had a minimum at $\mu = 0.11$ for butyrylcholinesterase. The most active electrolytes were those of CsCl and $BaCl_2$, and the least active chlorides were LiCl and $MgCl_2$.

76-0207. Harvey, A. L.; Dryden, W. F. (Dep. Physiol. Pharmacol., Univ. Strathclyde, Glasgow G1 1XW, Scotland). **The actions of some anticholinesterase drugs on skeletal muscle in culture.** *J. Pharm. Pharmacol.* 26(11): 865-870; 1974. (22 references)

The actions of the anticholinesterase drugs, physostigmine, neostigmine, and diisopropylfluorophosphate, on aneural cultures of skeletal muscle were studied using chick embryonic muscle in culture. Physostigmine 0.1 and 0.01 μM concentrations had no potentiating action on responses to acetylcholine. Neostigmine (also 0.1 μM and 0.01 μM) was similar except that a reduction in the acetylcholine response with 1.0 μM concentration was noted. At these concentrations physostigmine and neostigmine themselves had little effect on membrane potential. In examining the direct effects of physostigmine and neostigmine on the membrane potential both drugs caused depolarization, although they were less potent than acetylcholine or carbachol. Neostigmine was more potent than physostigmine: the concentration of neostigmine producing a depolarization 50% of the maximal response to carbachol was about 60 μM while the equivalent concentration of physostigmine was about 3 μM. The rate of repolarization in the presence of acetylcholine was greater in the diisopropyl-fluorophosphate (DFP) cultures than in controls. To investigate the possible action of DFP on the depolarization response to an agonist, cultures were incubated with 54.0 μM DFP for 10 min. Responses to acetylcholine and carbachol were then measured in the continued presence of DFP. The rate of recovery, taken as an indication of desensitization, was much faster with DFP than in controls. Both acetylcholine and the cholinesterase-stable agonist, carbachol, were affected, indicating that this effect of DFP is unlikely to be related to cholinesterase inhibition. In addition to its action on rate of repolarization, DFP reduced the depolarization responses to acetylcholine and carbachol. It is concluded that DFP affects the receptor-ionic conductance modulator complex, suggesting that such a mechanism operates in cultured skeletal muscle.

76-0208. Yacobi, A.; Levy, G. (Dep. Pharmaceutics, Sch. Pharm., State Univ. New York, Buffalo, NY 14214). **Comparative pharmacokinetics of coumarin anticoagulants XIV: Relationship between binding, distribution, and elimination kinetics of warfarin in rats.** *J. Pharm. Sci.* 64(10): 1660-1664; 1975. (13 references)

The relationships between the protein binding, distribution, and kinetics of elimination of warfarin were studied in male Sprague-Dawley rats injected with ^{14}C-warfarin (0.6 mg/kg, i.v.) . Individual animals eliminated warfarin by apparent first-order kinetics, with a biological half-life of 5.9-41.3 hr and a total plasma clearance of 2.4-22.0 ml/kg/hr. There was a strong positive correlation between the apparent volume distribution (Vd) and the elimination rate constant (kel). There was no apparent concentration dependence involved in the binding of warfarin to serum proteins, but there were pronounced intersubject variations in protein binding, with the free fraction of drug (f) in the serum ranging from 1.72 mM to 15.3 mM. There were strong positive correlations between f and kel, f and Vd, and f and the kidney:serum warfarin concentration ratio. There was an excellent positive linear correlation between f and the total plasma clearance of the drug. The intersubject variation in f was not related to variations in serum albumin or the total protein concentration, but there was a strong correlation between the values of f for serum and liver homogenates from individual animals. The data shows that the pronounced intersubject variation in the elimination of warfarin was related to interindividual differences in the plasma protein binding of the drug. The differences in protein binding could not be ascribed to differences in plasma protein concentrations and may reflect configurational differences in proteins or the presence of an endogenous displacing agent at different concentrations.

76-0209. Klaassen, D. C. (Clin. Pharmacol.-Toxicol. Cent., Univ. Kansas Med. Cent., Kansas City, KS). **Effect of microsomal enzyme inducers on the biliary excretion of cardiac glycosides.** *J. Pharmacol. Exp. Ther.* 191(2): 201-211; 1974. (29 references)

Rats were treated with phenobarbital (PB, 50 mg/kg), pregnenolone-16 - carbonitrile (PCN, 75 mg/kg), spironolactone (S, 75 mg/kg), or 3-methylcholanthrene (3-MC, 20 mg/kg). After 4 days, the same rats received i.v. doses of digitoxin (2.5 mg/kg), digoxin (7 mg/kg), or ouabain (5 mg/kg). For 2 hr after dosing the plasma disappearance and biliary excretion of the cardiac glycosides were measured. The rate of biliary excretion of digitoxin was increased 1000 and 400%, respectively, by PCN and S. Excretion was increased only 25% by PB and was decreased by 3-MC. With ^{3}H-digoxin, PCN and S increased rate of biliary excretion of tritium by 400 and 150%, respectively, whereas PB increased it by 25%, and 3-MC decreased it. The excretion of polar metabolites in rats given ^{3}H-digoxin was not increased. This is contrary to earlier reports concerning digitoxin. The increased excretion was due to a more lipid-soluble metabolite, digoxin-bis-digitoxoside, and to the parent compound. The biliary excretion of ouabain was increased by PCN, S, and PB, by 150, 50 and 80%, respectively. Ouabain is a cardiac glycoside that is not biotransformed before it is excreted. The results of these studies suggest that there is a marked difference in the ability of microsomal enzyme inducers to enhance the biliary excretion of cardiac glycosides and that the mechanism is not solely dependent on biotransformation of the glycoside to more polar metabolite.

76-0210. Klaassen, C. D. (Dep. Pharmacol., Univ. Kansas Med. Cent., Kansas City, KS). **Stimulation of the development of the hepatic excretory mechanism for ouabain in newborn rats with microsomal enzyme inducers.** *J. Pharmacol. Exp. Ther.* 191(2): 212-218; 1974. (22 references)

Ouabain in a 3-day-old rat has an LD50 about 1/40th that of the adult rat. The inability of the liver to remove ouabain from the plasma and to excrete it into the bile is largely responsible for this great difference. Microsomal enzyme inducers were used to treat newborn rats in an effort to determine whether they would enhance the development of the hepatic excretory system, thereby decreasing the toxicity of ouabain. Phenobarbital (33 and 50 mg/kg) was given to 1, 6, 10, 16, 21, 26, or 31 day old rats for a period of 4 days. Similarly rats were treated with pregnenolone-16α-carbonitrile (PCN, 75 mg/kg), spironolactone (S, 75 mg/kg), or 3-methylcholanthrene (20 mg/kg). Ouabain was administered (4 mg/kg, i.v.) on day 5. The amount of ouabain in the plasma and the liver and the amount excreted into the intestine were determined 15 min after injection. Hepatic clearance of ouabain in the neonates was enhanced by phenobarbital, PCN, and S. However, 3-methylcholanthrene did not enhance clearance of ouabain. PCN and S were more effective than phenobarbital. Three or 4 times more ouabain was present in the liver and bile of the PCN and S treated 10 day old rats than in controls. After 15 mg/kg of ouabain was administered i.p. to 10 day old rats, 92% of them died within 24 hr. A death rate of 90% was achieved after 3-methylcholanthrene pretreatment. The other inducers protected the rats. None died after PCN, 33% died after S, and 68% died after PB. The results of these studies allow the conclusion that some microsomal enzyme inducers will markedly enhance the development of the hepatic excretory mechanisms that remove ouabain from the plasma, thus decreasing its toxicity.

76-0211. Belyayev, V. I. (Nar'yan-Marc Agricultural Station, USSR). **Vliyanie fosfororganicheskikh soedineniy, vvedennykh v zhelotochnyy meshok, na razvitiye embrionov kur. [Effect of organophosphorus compounds introduced into the yolk sac on the development of chick embryos.]** *Khim. Sel'sk. Khoz.* 12(9): 623-626; 1974. (18 references) (Russian)

Amidophos (crufomate), trichlorometaphos-3, (vonnel), and trichlorfon, dissolved in distilled water or in sunflower-seed oil, were injected in different doses into the yolk sac of chick embryos before incubation. The embryotoxicity was determined from the hatching rate. Both sunflower-seed oil and distilled water were found to be embryotoxic. Aqueous solutions of amidophos and trichlorometaphos-3, injected in doses of 0.01-10 mg/kg, and trichlorfon, injected in doses of 0.01, 0.1, 20, and 200 mg/kg, retarded the embryonal development, and caused increased embryonal lethality. When injected in doses of 0.2, 1, 2, and 10 mg/kg, trichlorfon exerted a growth-stimulating effect, and caused reduced embryonal mortality.

76-0212. Enkina, O. V.; Vasil'ev, D. S. (All-Union Sci. Res. Inst. Oleaginous Crops, USSR). **Vliyanie ramroda i lasso na mikrobiologicheskuyu aktivnost' pochvy na posevakh podsolnechnika. [Effect of ramrod and lasso on the microbiological activity of the soil in sunflower plantings.]** *Khim. Sel'sk. Khoz.* 12(10): 778-780; 1974.

Effects of ramrod (propachlor) and lasso (alachlor) at 6 kg/ha (400 l/ha), on the microbiological activity of the soil was studied in sunflower plantings in loamy chernozem with low humus content under the conditions prevailing in Kuban'. Neither ramrod nor lasso suppressed the activity and growth of the soil microorganisms. Certain bacterial populations increased by 11-51%. Lasso increased the population of certain bacteria, and especially enhanced nitrification processes, as is indicated by the increased nitrate nitrogen content in soils treated with this preparation.

76-0213. Neklesova, I. D.; Kudrina, M. A.; Iraidova, I. S. (A. E. Arbuzov Inst. Organic and Physical Chemistry, Acad. Sci. USSR, USSR). **Sinergizm toksicheskogo deystviya nekotorykh fosfororganicheskikh soedineniy. [Synergism of the toxic action of some organophosphorus compounds.]** *Khim. Sel'sk. Khoz.* 12(11): 838-839; 1974. (14 references) (Russian)

The possible synergism of the toxic action of *O*-(2,2-dichlorovinyl) -*N*,*N*,*N'*,*N'*- tetramethyldiamidophosphate (compound A) and *O*-ethyl -*S*-carbethoxymethyl- methylthiophosphonate (compound B) was studied in albino mice and houseflies. Compound A is known to be a selective inhibitor of aliesterase in vitro. The LD50 was determined to be 18 mg/kg for compound A and 240 mg/kg for compound B in albino mice. Binary mixtures containing 2.5% or 5% of compound A and 97.5% or 95% of compound B had LD50 values of 184 and 148 mg/kg, respectively. The low toxicity of compound B in warm-blooded organism may be due to the hydrolysis of the carbethoxy ester bond by aliesterases, which causes an increase in toxicity, i.e., synergism with compound A. The absence of synergistic effect in houseflies indicates a different metabolic pathway in this species.

76-0214. Trebukhin, M. V.; Veselova, T. P. (VITIS, USSR). **Izuchenie vozmozhnogo pobochnogo vliyaniya geksakhlorparaksilola na generativnuyu funktsiyu krupnogo rogatogo skota. [Possible side-effect of hexachloro-*p*-xylene on the reproductive function of cattle.]** *Khim. Sel'sk. Khoz.* 12(11): 860-864; 1974. (8 references) (Russian)

The possible effect of hexachloro-*p*-xylene, used as

an anthelmintic at a rate of 0.5 g/kg of feed was studied on the reproductive function in cattle. The preparation had no effect on fertilization, fertility, and stillbirth rate when administered to cows at the time of insemination and at different stages of the pregnancy. It had no teratogenic effect when administered to the cows during the period from insemination to the 75th day of pregnancy. Hexachloro-*p*-xylene caused no changes in the quality of the ejaculate of breeder bulls.

76-0215. Korotkova, O. A. (All-Union Sci. Res. Inst. Chemical Plant Protective Agents, USSR). **Razlozhenie fungitsidov—proizvodnykh ditiokarbaminovoy kisloty. [Obzor Literatury). (Decomposition of such fungicides as derivatives of dithiocarbamic acid (Literature review).]** *Khim. Sel'sk. Khoz.* 12(11): 869-874; 1974. (24 references) (Russian)

The decomposition of dithiocarbamic acid-derived fungicides in the soil, water, plant, and warm-blooded organisms is reviewed. Ethylenethiourea, which is most stable in soil at pH 6, is eliminated from the soil in about one month. The half-life period of this substance in water is about 3 weeks. Ethylenethiourea is decomposed by UV irradiation, especially in the presence of sensitizers, such as α-acetonaphthone, α-naphthaldehyde, and eosine. Bis-(imidosolyl-2) sulfide or imidosolidon-2-e were found as photolytic metabolites. Ethylenethiourea, ethylenethiuram monosulfide, and sulfur were identified as the metabolites of ethylene-bis-dithiocarbamates in plants. Ethylenethiourea is present in tomatoes from about 3 days. Heat treatment of food products results in ethylenethiourea formation. Rats poisoned with daily 250 or 500 mg/kg-doses of ethylenethiourea for one year developed cancer of the thyroid gland. Ethylenethiourea is a byproduct present in all ethylene-bis- dithiocarbamates, and is formed during the storage of technical preparations, solutions, and suspensions. Dithiocarbamates are hydrolyzed to carbon disulfide and dimethylamine at pH values below 7. Alkyldithiocarbamates form conjugates with glucose and alanine in plants. Tetramethylthiourea, TMTD, dimethylamine salt of dimethyldithiocarbamic acid, and carbon disulfide were identified as the metabolites of ziram in rats. The findings indicate that dithiocarbamates are decomposed in the environment fairly rapidly, while the toxic metabolites persist for 1.5-2 months.

76-0216. Konyukhov, A. F.; Poloz, D. D.; Kokhtyuk, F. P. (All-Union Inst. Exper. Vet. Med., USSR). **Nakoplenie i dlitel'nost' sokhraneniya fozalona v organakh kur pri ostrom otravlenii. [Accumulation and persistance of phosalone in the organs of chickens after acute poisoning.]** *Khim. Sel'sk. Khoz.* 13(6): 59-60; 1975. (Russian)

The residue dynamics of phosalone were studied by thin-layer chromatographic method in different organs of chickens poisoned with 1,800, 1,700, 1,600, and 1,400 mg of phosalone per kg of body weight. The pesticide was administered through a stomach tube. General depression, immobilization, loss of appetite, motor dyscoordination, tremor, diarrhea, hypersalivation, and lachrymation were observed a few hours after poisoning. The skeletal muscles, liver, kidneys, and gastric contents of chickens that died within the first day after poisoning contained 4, 6, 10, and 30-40 mg of phosalone per kg. The corresponding phosalone levels found in the same organs of chickens that died in 5 days after poisoning were 2, 3.5, 1.5, and 30 mg/kg. Liver, kidney, and skeletal muscle samples from surviving animals that were killed 13 days after poisoning contained 1 mg of phosalone per kg, while the gastric contents had a residue level of about 2 mg/kg. This residue originated from the muscular tissue of the gastric wall. Traces of phosalone were found in the organs of animals killed 23 days after poisoning, while no residues were found in animals killed 30 days after poisoning. Normalization of the cholinesterase activity in 30 days was observed.

76-0217. Grigor'eva, L. V.; Dubovoy, V. P.; Makeev, A. M.; Chkanikov, D. I. (All-Union Sci. Res. Inst. Phytopathology, USSR). **Ob osobennostyakh obrazovaniya 2,4-dikhlorfenola pri dekarboksimetilirovanii 2,4-D rasteniyakh. [Pecularities of 2,4-dichlorophenol formation during the decarboxymethylation of 2,4-D in plants.]** *Khim. Sel'sk. Khoz.* 13(8): 57-61; 1975. (14 references) (Russian)

The decarboxymethylation of ^{14}C-labeled 2,4-D was studied in strawberry plants. The rate of decarboxylation of 2,4-D was found to be nearly the same as the rate of 2,4-dichlorophenol formation, which can be interpreted as evidence of the separation of the 2,4-D side chain in the form of a fragment containing two carbon atoms. Most of the 2,4-D that had penetrated into the plant is subjected to decarboxymethylation during the first 3 to 7 days. The 2,4-dichlorophenol formed is of relatively high stability in the plant tissues, and persists, in the form of glycosides, for several months. The 2,4-dichlorophenol formed in 2,4-D-treated plants is subject to glycosidation. As the plants containing high concentrations of 2,4-dichlorophenol were developing normally, this metabolite can be regarded as a detoxification product of 2,4-D.

76-0218. Yang, R. S. H.; Coulston, F.; Golberg, L. (Inst. Comp. Human Toxicol., Albany Med. Coll., Albany, NY 12208). **Binding of hexachlorobenzene to erythrocytes: species variation.** *Life Sci.* 17(4): 545-550; 1975. (17 references)

An in vitro study revealed that hexachlorobenzene binds to the erythrocytes of rats, mice and rabbits, but that there is little or no such binding in 14 other species, including humans and rhesus monkeys. This binding is not a general phenomenon for all chlorinated hydrocarbon pesticides, since similar experiments using ^{14}C-DDT and ^{14}C-mirex have failed to demonstrate this effect. Structural integrity of the erythrocytes may be important in this binding process since hexachlorobenzene binds poorly to rat ghost cell membranes. (Author abstract by permission)

76-0219. Nair, K. S.; Ramakrishnan, C.; Sithanantham, S. (Dep. Entomol., Tamil Nadu Agric. Univ., Coimbatore 641003, India). **Effect of soil application of insecticides on the nutrient status, bacterial population and yield in rice soils.** *Madras Agric. J.* 60(7): 441-443; 1973. (7 references)

The effect of soil application of insecticides on the nutrient status as well as on the total bacterial population of rice soils was studied. Two field experiments, consisting of 16 treatments, were carried out. Three insecticides were used: Sevidol (4:4) granule, γ-BHC 10% granule, and endrin 2% granule, each at five dosage rates, 0.45, 0.90, 1.35, 1.80, and 2.25 kg a. i./ha, plus one untreated control, with 3 replications laid out in randomized block design. The insecticides were applied twice, one at 15 and the other at 45 days after planting by broadcasting the granules uniformly. The data of the study indicates that application of the insecticides had no significant effect on the available nitrogen or phosphorus status of the soil. Significant differences among the insecticides were noted in their influence on the available potassium content of the soil. No consistently significant influence of these insecticides and/or dosages was noted on the bacterial population of the soil. Insecticide application did have significant influence on the grain yield. The difference between insecticides and their dosages was significant. Sevidol was most effective in increasing rice yields, followed by endrin and γ-BHC. There was also a dose-dependent increase in the yield.

76-0220. Bodai, J.; Tamas, L.; Vegh, A. (2870 Kisber, Mest. Term. Foallomas, Hungary). **Dikonirt-mergezes szaporodasbiologiai kovetkezmenyei szar vas marhaban. [Reproductive consequences of dikonirt toxicosis in cattle.]** *Magyar Allatorv. Lapja* 29(5): 319-322; 1974. (10 references) (Hungarian)

After feeding 2,4-D-Na containing Dikonirt herbicide treated grass, forage, and silage to cattle, reproductive failures were observed in the herds. It was determined that the compound accumulated in the body, therefore allowing toxic levels to be reached in the animals between 5 and 6 days and 6 weeks from the beginning of grazing on treated pastures or of feeding the treated feeds. Manifestations of anestrus and ovary atrophy may affect as much as 40% of the herd after prolonged exposure. The severity of the condition and the extent of the loss seem related to the amount of the compound consumed.

76-0221. Casselton, L. A.; Casselton, P. J. (Dep. Plant Biol. Microbiol., Queen Mary Coll., London, England). **Functional aspects of fluoroacetate resistance in *Coprinus* with special reference to acetyl-CoA synthetase deficiency.** *Mol. Gen. Genet.* 132(3): 255-264; 1974. (25 references)

Mutants of *Coprinus lagopus* unable to utilize acetate were selected on a glucose medium containing the toxic analog fluoroacetic acid. The mutants map at 3 unlinked loci, designated *acu-1*, *acu-11*, and *acu-12*. At the *acu-1* locus, mutations lead to loss of acetyl-CoA synthetase activity. The functions of the other two loci were not resolved. However, they were shown not to involve either this enzyme or isocitrate lyase. When combined in pairs in dikaryons or heterozygous diploids, mutants at different loci showed normal complementation, thus showing that there is no localized intranuclear activity of the gene products involved. Tests for interallelic complementation between twenty-five differently isolated *acu-1* mutants proved negative. This finding indicates that the acetyl-CoA synthetase activity is carried on a single polypeptide.

76-0222. Froede, H. C.; Wilson, I. B. (Sch. Pharm. and Dep. Chem., Univ. Colorado, Boulder, CO 80302). **Equilibrium constants and relationships in the inhibition of serinesterases by organophosphates.** *Mol. Pharmacol.* 10(4): 696-702; 1974. (21 references)

The equilibrium constants for the reactions of diethyl phosphofluoridate with eel acetylcholinesterase, bovine red cell acetylcholinesterase, horse serum butyrylcholinesterase, and bovine α-chymotrypsin were measured. The values obtained were 2.3×10^4, 3×10^5, 6.4×10^6, and 6×10^8, respectively, in terms of analytical concentrations at pH 7.0 and 25°, with water activity as unity. These were converted to equilibrium constants for the hydrolysis of the diethylphosphoryl-enzyme derivative: 5.2×10^{10}, 4×1^{-9}, 2×10^8, and 2×10^6, respectively. These values enable one to calculate the equilibrium constant for the reaction of these enzymes with any diethyl phosphate ester whose equilibrium constant for hydrolysis is known. If the rate constant for inhibition is also known, the rate constant for reactivation of the inhibited enzyme can be calculated. These calculations were made for diethyl *p*-nitrophenyl phosphate and the conjugate reactivator *p*-nitrophenol and checked experimentally for the eel enzyme. (Author abstract by permission)

76-0223. Bidwell, K.; Weber, E.; Neinhold, I.; Connor, T.; Legator, M. S. (Roger Williams Gen. Hosp., Brown Univ., Providence, RI 02908). **Comprehensive evaluation for mutagenic activity of dieldrin.** *Mutat. Res.* 31(5): 314; 1975.

In order to test the mutagenic potential of the widely used insecticide, dieldrin, the following comprehensive analysis was undertaken: direct bacterial tests with and without microsomal activation, host-mediated assay, blood and urine analysis for active metabolites, micronuclei test, metaphase analysis, dominant lethal test, and heritable translocation test. In the majority of animal tests, three concentrations of dieldrin were used (0.08, 0.8, and 8 mg/kg), usually administered by gavage on a subacute basis. Since dieldrin was formulated in corn oil, the negative control was corn oil administered by gavage in dosage and schedule equivalent to the test compound. The positive control was 0.5 mg/kg of TEM in saline, injected i.p. 24 hr before sacrifice for cytogenetic tests and administered by gavage once per day for five days before mating for the dominant lethal and heritable translocation tests. Overall evaluation of the data from mice indicates that

dieldrin is negative in all four animal tests. The *Salmonella* tester strains used in all bacterial tests included excision repair-deficient mutants, partial and total lipopolysaccharide-deficient mutants, and both frameshift and base analog detection strains. No increase in number of mutants was found in any of the five bacteria tested. (Author abstract by permission)

76-0224. Gentile, J. M.; Plewa, J. (Yale Univ. Med. Sch., New Haven, CT 06510). **A bio-assay for host-mediated proximal mutagens in agriculture.** *Mutat. Res.* 31(5): 317; 1975.

A model system was developed to determine metabolic products of agricultural herbicides and pesticides which are mutagenic. Maize plants (inbred H51-MP546 [WX/WX]) were grown in trays (100 plants/tray) under controlled greenhouse conditions. Individual trays were treated with known concentrations of a test chemical and the seeds allowed to germinate. Several plants per group were grown to anthesis and the tassels cut off and stored in ethanol. Pollen samples from each group were stained with IKI and the appearance of WX mutations scored. The remaining plants were harvested after one week of growth, washed, and root tips sampled for cytological analysis. The remaining plant tissue was homogenized, filtered and centrifuged at 10,000 x g to give a soluble fraction. This material was then lyophilized and stored under N_2. The lyophilized material was resuspended in sterile water at different concentrations, and tested for mutagenicity by measuring its ability to revert standard tester strains of bacteria and yeast. This system has distinct advantages in that: the chemical used is tested under conditions similar to those experienced in the field, the presence of any proximal mutagen is tested on both procaryotic and eucaryotic genomes, and any genetic effect of the chemical itself can be tested in the maize plant using the WX locus with a high degree of resolution. A preliminary study using the herbicide atrazine (2-chloro -4-[ethyl -amino] -6-[isopropylamino] -*s*-triazine) and yeast as the indicator organism suggests some mutagenic activity in extract obtained from treated plants, although no chromosomal damage is observed in the plants themselves. The effects of several additional herbicides are presently being studied. (Author abstract by permission)

76-0225. Sparrow, A. H.; Schairer, L. A. (Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11973). **Interaction of exposure time and gaseous mutagen concentration on somatic mutation frequency in *Tradescantia*.** *Mutat. Res.* 31(5): 318; 1975.

An understanding of the relationship between duration of exposure and mutagen concentration is necessary to determine an optimal exposure time in order to compare relative mutagenicity of acute or chronic exposures to gaseous chemical mutagens. In this study cuttings of Tradescantia clone 4430 were exposed to vapors of 1,2-dibromoethane (DBE) for periods of 2, 4, 6, 12 and 18 hr and at concentrations of 2, 6, 12, 15, 50 and 100 ppm. The resulting pink-celled stamen hair mutation data are expressed as mean values for the peak response period (8 to 10 days after exposure). Since mutation frequency increased with both time of exposure (t) and increasing mutagen concentration (c), mutation frequencies were plotted against the product (ct). The resultant linear regression had a slope of 0.861 with a correlation coefficient of 0.702, indicating that mutation response increases nearly linearly with (ct) over the ranges tested. These results suggest that data on the effectiveness of low concentrations of mutagens can be obtained most efficiently with longer exposure times. For prolonged exposures covering several cell cycles it is expected that a response plateau would be reached as previously shown for chronic radiation exposures. The Tradescantia test system is well adapted for low concentration chronic exposures and such experiments are planned. (Author abstract by permission)

76-0226. Nauman, C. H.; Sparrow, A. H.; Schairer, L. A.; Sautkulis, R. C. (Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11973). **Influences of temperature, ionizing radiation and chemical mutagens on somatic mutation rate in Tradescantia.** *Mutat. Res.* 31(5): 318-319; 1975.

Relative to normal growing temperatures of 18-20°C, mutation rates of Trasdescantia clones 02 and mutable 0I06 are increased by factors of 2.6 (at 28°C) and 3.4 (at 26.5°C), respectively. Mutable clone 0I05 is an X-ray induced mutant of the parent clone 02 and has a very high spontaneous rate of blue to pink mutations in petal and stamen hair cells. Relative to the response of clone 02 to X-rays, the spontaneous rate in clone 0I06 in recent experiments is equal to that induced by 27 rads (at 18-20°C) or 68 rads (at 26.5°C). The high spontaneous rate in clone 0I06 indicates that it may be repair deficient for the DNA lesions which induced pink mutations. This indication is supported by the fact that 10-160 rad of X-irradiation induces in this clone a pink mutation response which is significantly greater than that of clone 02. The kinetics of mutation induction after six hour exposures to EMS (ethyl methanesulfonate) and DBE (1,2-dibromoethane) varies among three clones of Tradescantia: dose-response curves for clone 0I06 have slopes less than plus one, while those for clones 02 and 4430 are greater than plus one for both chemicals. An increase in temperature to 28°C during treatment of clone 02 does not alter the mutation rate induced by 100 rad of X-rays, nor does an increase to 26.5°C during treatment of clone 4430 with 50 ppm of DBE. A comparison of dose-response curves induced by X-irradiation and by two chemical mutagens will be made. (Author abstract by permission)

76-0227. Jagannath, M. S.; Gowda, R. N. S.; Nagaraja, K. V.; Hegde, K. S. (Vet. Coll., Univ. Agric. Sci., Hebbel, Bangalore, India). **Effect of 2-isopropoxyphenyl -*N*-methylcarbamate (Dalf dust) on ectoparasites of domestic animals.** *Mysore J. Agric. Sci.* 8(3): 444-446; 1974. (1 reference)

The use of Dalf dust against ectoparasites in different types of animals was studied. The dalf dust contained 1% 2-isopropoxyphenyl-*N*-methylcarbamate (propoxur). The infested animals, including 22 head of cattle, 17 dogs, 5820 birds, 200 white rats, and 15 guinea pigs, were dusted with this insecticide. House animals were also dusted after protecting all food and drinking water sources. The post-treatment density of the parasites was observed at regular intervals for a period of 10-12 weeks. Out of 22 heads of cattle tested, 15 harbored ixodid ticks. Six had *Boophilus microplus*, 4 had *Hyalomma marginatus isaaci*, and 5 had both. *Haematopinus eurysternus* was seen on 3 of 7 animals affected with lice. *Bovicola bovis* and *Linognathus vituli* were noted on 2 animals each. Density of infestation of both ticks and lice was heavy to moderate. Of the 17 dogs 10 had *Rhipicephalus sanguineus* fleas; all had ticks; 5 showed *Ctenocephalides felis felis* mites, 2 had *Sarcoptes scabiei*. *Ornithonyssus bursa* was encountered on 5320 birds. Infestation by *Menopon gallinae* was noted in 550 birds. Another 500 birds were heavily infested with *Menacanthus stramineus*. In white rats a heavy infestation of *Ornithonyssus bursa* was noted. The 15 guinea pigs were moderately to heavily infested with *Gyropus ovalis* and *Gliricola porcelli*. After dusting with Dalf dust, the larval forms and male ticks were dead within 30-60 min. Although a large number of engorged females were also dead, some were found alive for nearly 6 hr. All lice were immobilized or showed only weak trembling movements within an hour after treatment; none were found after 24 hr. Except for 2 trials in which poultry and rat mites were unusually heavy, mites were dead at the end of 24 hr. The dogs affected with mange showed considerable improvement after treatment. Scratching stopped within 24-28 hr and hair replacement started 2 to 3 weeks later. Fleas died within 10-15 min after dusting. No fresh infestation was noted for the ensuing 10-12 weeks. No toxic or adverse effects were noted on any animal during the trial. The results allow the conclusion that the acaricidal efficacy of this drug appears very good with initial and residual properties suitable for quick control of ectoparasites in livestock.

76-0228. Hanada, S. (Sch. Fermentation Chem., Fac. Pharm., Meijio Univ., Nagoya, Aichi, Japan). [**Studies on diphenyl and *o*-phenylphenol as food additives from the public health viewpoint. Part 1. Fungicidal activity.**] *Nagoya Shiritsu Daigaku Igaku Zasshi (J. Nagoya City Univ. Med. Assoc.)* 26(1): 78-86; 1975. (8 references) (Japanese)

Diphenyl is not registered as a pesticide in Japan but, due to its fungicidal activity, it is permitted indirect use as a food additive as a component of paper sheets used to wrap citrus fruits. The use of *o*-phenylphenol as such is prohibited. When *o*-phenylphenol was found in imported grapefruits, the migration of diphenyl and *o*-phenylphenol into citrus fruits, their fungicidal and preservative activity on fruits in storage, and effects on skin stimulation in rats were studied. W-strain rats were painted on their shaved backs daily with a 500 ppm acetone solution of diphenyl or *o*-phenylphenol. The seventh day revealed body weight decreases from 500 to 380 g with reddened and slightly swollen skin on rats treated with *o*-phenylphenol. Hemorrhage was seen in 15 days. The body weight of rats treated with diphenyl showed a slight decrease; however, no abnormalities were found on the treated skin until 15 days had elapsed.

76-0229. Tsuda, H. (First Sch. Pathol., Fac. Med., Nagoya Municipal Univ., Nagoya, Aichi, Japan). [**Studies on the effects of 3-amino-1,2,4-triazole in rat thyroids.**] *Nagoya Shiritsu Daigaku Igakkai Zasshi (J. Nagoya City Univ. Med. Assoc.)* 26(1): 87-94; 1975. (25 references) (Japanese)

An aqueous solution (2500 ppm) of amitrole, 3-amino-1,2,4-triazole, was orally administered to two groups of female Wistar rats. The first group was given 6 and 20 ml of the solution during a short period; the second group was given the amitrole as drinking water, ad lib., for 3, 10, and 30 days. Initial symptoms consisted of cuboid deformation of the thyroidal follicular epithelium, decrease of colloid, dilatation of rough-surfaced endoplasmic reticulum, and decrease of peroxidase activity therein. Goiter became visible with papillous proliferation during continued administration. After more than 30 wk of administration, numerous proliferated, malignant, goiter-like lesions appeared with infiltration of goiter tissues into capsules surrounding tissues and vessels. Dysplastic nodal papillous adenoma also appeared. Against heterotopic thyroids, 3-amino-1,2,4-triazole caused a more frequent appearance of malignant goiter.

76-0230. McPherson, F.; Bridges, J. W.; Parke, D. V. (Dep. Biochem., Univ. Surrey, Guildford GU2 5XH, Surrey, England). **In vitro enhancement of hepatic microsomal biphenyl 2-hydroxylation by carcinogens.** *Nature* 252(5483): 488-489; 1975. (11 references)

The in vitro incubation of some chemically dissimilar compounds which are carcinogenic to rat hepatic microsomes in the presence of NADPH produced a selective increase in biphenyl 2-hydroxylation, but had no significant effect on biphenyl 4-hydroxylation. Non-carcinogens do not enhance either hydroxylase. These observations may be the result of a direct effect of the carcinogens themselves, or may be mediated by the formation of active metabolites. These results indicate that the study of the in vitro enhancement of biphenyl 2-hydroxylase in hepatic microsomes in the presence of a NADPH-regenerating system may prove a basis for a preliminary screening system which, in conjunction with other such tests, may be of considerable value in detecting potential carcinogens.

76-0231. Dinnendahl, V.; Stock, K. * (Inst. Pharmakol., Med. Hochschule Hannover, Hanover, Germany). **Effects of Arecoline and cholinesterase inhibitors on cyclic**

guanosine 3′,5′-monophosphate and adenosine 3′,5′-monophosphate in mouse brain. *Naunyn-Schmiedeberg's Arch. Pharmacol.* 290(2/3): 297-306; 1975. (21 references)

In mice, Arecoline in vivo dose-dependently increased the cGMP concentrations of the cerebellum and the "cerebrum" (= parts of cortex, hippocampus, hypothalamus, thalamus, striatum and midbrain) without influencing the cAMP levels. The cholinesterase inhibitors paraoxon and physostigmine caused an elevation only in "cerebrum", whereas the cGMP content of the cerebellum even decreased. Pretreatment with atropine prevented the rise in cGMP levels as well as the symptoms of cholinergic stimulation elicited by arecoline or paraoxon. Diazepam reduced cGMP levels below control values and blocked the effect of arecoline, while typical symptoms due to arecoline, e.g., tremor and salivation, remained unaffected. The tripeptide prolyl-leucyl-glycinamide (MIF) had no effect on either cGMP values or the peripheral signs of cholinergic stimulation elicited by arecoline. The results show that elevation of cGMP in the central nervous system caused by cholinomimetic agents can be prevented not only by cholinolytics, blocking muscarinic receptors, but also by influencing other mechanisms which are discussed. (Author abstract by permission)

76-0232. Ando, M.; Wakisaka, I. (Sch. Public Health, Fac. Med., Kagoshima Univ., Kagoshima, Japan). [**The action of cadmium on the metabolism of *p,p′*-DDT.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10, spec. suppl.): 493; 1975. (Japanese)

To evaluate the hypothesis that cadmium might affect the metabolism and residual amounts of *p,p′*-DDT as it alters the metabolism of lipids such as cholesterol, experiments were performed on three groups of male Wistar rats. The groups were treated as follows: (1) s.c. with 1 mg cadmium chloride/kg,,(2) p.o. with 20 mg *p,p′*-DDT/kg and (3) s.c. with cadmium chloride plus p.o. with *p,p′*-DDT at the same doses as (1) and (2). Although *p,p′*-DDE was detected in adipose tissue from untreated rats, a significantly lower amount was detected in the group treated with cadmium chloride than in the group not treated with it. Also, the ratio of the sum of DDE plus DDD to total DDT was significantly higher in the group treated with DDT and cadmium than in the group treated only with DDT. These facts suggest a positive effect of cadmium in metabolizing or excreting DDT. The results of separate experiments, in which hexobarbital sleeping time was not affected, testify against an effect of DDT metabolism by cadmium.

76-0233. Fujita, K.; Fujita, H.; Funazaki, Z. (Saku Gen. Hosp., Nagano, Japan). [**Chromosomal abnormality caused by 2,4,5-T.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 24(2): 77-79; 1975. (5 references) (Japanese)

After 48 hr incubation of adult human blood in a culture medium containing Bacto phytohemagglutinin-M (PHA), 2,4,5-T was added at 10, 1.0, 0.1, and .01 μm/l, respectively, and incubated for 24 hr. Colchicine was added 3 hr before ending incubation. Micrographs were taken after fixation of leucocytes, hypotonic treatment, and Giemsa staining. It was found that the frequency of chromatid aberration increased as contrasted to controls and the frequency was higher as the concentration of 2,4,5-T increased. The most frequent aberration was of the single chromatid type.

76-0234. Parafiniuk, W.; Chosia, M.; Blazniak, H.; Humiczewska, M.; Krygier-Stojalowska, A. (Dep. Pathol. Anat., Acad. Med., Szczecin, Poland). **Z badan nad toksykologia herbicydow. I. Badania pluc szczurow zatruwanych przewlekle herbicydami (simazinem).** [**Studies on toxicology of herbicides. I. A study on lungs of rats chronically poisoned with a herbicide (simazine).**] *Patol. Pol.* 26(2): 227-245; 1975. (20 references) (Polish)

Simazine was administered intragastrically in 133 Wistar rats at 15 mg/day on experimental days 7, 24, 30, and 60. The animals were anesthetized and sacrificed at 24 hr, 7 days, and 21 days after discontinuation of simazine administration. Excised lungs were examined histologically and lipids were determined by thin-layer chromatography; histoenzymatic studies were performed; and oxygen consumption was measured using the Warburg apparatus. Pseudoeosinophilia appeared periodically. The lymphoid system was stimulated and numbers of granular pneumocytes were increased. The chromatographic values for lipids were increased, succinate dehydrogenase and cytochrome oxidase activities were enhanced, and consumption of oxygen by lung tissue was increased. These phenomena may constitute an expression of an adaptive response to pesticide stress.

76-0235. Zimnoch, L.; Rudzki, Z.; Kurlowicz-Sidun, B. (Dep. Pathol. Anat., Acad. Med., Bialystok, Poland). **Badania histochemiczne nerek szczura w ostrym zatruciu octanem fenylorteciowym.** [**Histochemical studies on the rat kidney in acute poisoning with phenylmercuric acetate.**] *Patol. Pol.* 26(2): 247-256; 1975. (21 references) (Polish)

Single 0.1 LD50 doses of phenylmercuric acetate were administered intragastrically to each of 20 white rats. Succinate dehydrogenase and acid and alkaline phosphatase activities were determined histochemically. Early in the experiment, changes in the enzyme activities examined were observed in the epithelium of the initial straight segment of the first-order convoluted tubules. Changes in enzyme activities were followed by degenerative changes of the type of epithelial thrombonecroses in the first-order convoluted tubules.

76-0236. Yu, S. J.; Terriere, L. C. (Dep. Entomol., Oregon State Univ., Corvallis, OR 97331). **Microsomal metabolism of juvenile hormone analogs in the house fly, *Musca domestica* L.** *Pestic. Biochem. Physiol.* 5(5): 418-430; 1975. (22 references)

Of six juvenile hormone analogs of the alkyl 3,7,11-trimethyl-2,4-dodecadienate type, only the isopropyl ester was found to be strongly morphogenic in the housefly, *Musca domestica* L. In vitro assays revealed

that housefly microsomes contain B esterases as well as oxidases which metabolize such analogs. However, these esterases did not hydrolyze the isopropyl ester, ZR-515. Enzymes prepared from larvae, pupae, and adults were all active and there was evidence that in the late larval stage, the esterase activity was cyclic, showing a minimum in the early third instar and a maximum a few hours later. When microsomes from two susceptible and two resistant housefly strains were compared for metabolic activity against the juvenile hormone analogs, those from the resistant strains were 1.3-20-fold higher in oxidase activity, but there was no difference in esterase activity. The oxidative metabolism of two analogues ZR-515 and 512 was greatly enhanced when the flies were induced with phenobarbital, but there was no enhancement of metabolism of three of the remaining analogues and only a slight enhancement of the fourth. It is concluded that the insecticidal action of ZR-515 is largely due to its stability in the presence of housefly esterases.

76-0237. Oppenoorth, F. J.; Voerman, S. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Hydrolysis of paraoxon and malaoxon in three strains of *Myzus persicae* with different degrees of parathion resistance.** *Pestic. Biochem. Physiol.* 5(5): 431-433; 1975. (30 references)

Homogenates of three strains of *Myzus persicae*, A, R, and E, with an LD50 for topically applied parathion of 9, 93, and 263 ng/aphid, respectively, showed an in vitro hydrolytic degradation of paraoxon of 2.3, 4.7, and 8.6 pmol/mg aphid/hr, respectively. These values represented the *V*max values, the *K*m being less than 1.0 μM. The three strains showed a malaoxon degradation of 2.4, 11.9, and 18.8 pmol/mg/hr at 1 μM; the *V*max for R and E was 21 and 27 pmol, respectively, and the *K*m was 7 and 0.4 μM, respectively. Activity in strain A was too low to estimate these values. The primary breakdown product of paraoxon was diethyl phosphoric acid, while that of malaoxon was dimethyl phosphoric acid. No hydrolysis of the carboxylester groups of malaoxon was observed. The hydrolysis of paraoxon and malaoxon was inhibited by isopropyl and *n*-propyl paraoxon and by the salioxon-analog K_2. The two latter compounds acted as synergists with parathion when added in amounts which caused little mortality when given alone. The hydrolytic enzyme was water soluble and retained its activity during several hr of incubation. It is likely that this enzyme was responsible for at least part of the observed resistance. Resistance was maintained without selection in these organisms for a period of 3 yr. There was no correlation between degree of resistance and carboxylesterase activity in the various strains.

76-0238. Akkermans, L. M. A.; Van den Bercken, J.; Versluijs-Helder, M. (Inst. Vet. Pharmacol. Toxicol., Univ. Utrecht, Utrecht, The Netherlands). **Comparative effects of DDT, allethrin, dieldrin, and aldrin-transdiol on sense organs of *Xenopus laevis*.** *Pestic. Biochem. Physiol.* 5(5): 451-457; 1975. (15 references)

The effects of DDT, allethrin, dieldrin, and aldrin-transdiol on the lateral-line organ and the cutaneous touch receptors of *Xenopus laevis* were studied in vitro. Nervous activity before and after pesticide exposure was recorded by means of a silver wire electrode. Nervous activity was also recorded in preparations from toads which had previously been exposed to the pesticides in question. DDT and allethrin produced pronounced repetitive firing in both sense organ preparations whether pesticide exposure was performed in vivo or in vitro. Dieldrin and aldrin-transdiol, on the other hand, failed to produce any sign of repetitive activity, although aldrin-transdiol caused a marked increase in the spontaneous firing of the lateral-line organ, followed later by a blockade. The repetitive activity in the cutaneous touch receptors induced by DDT or allethrin was not distinguishable from the repetitive firing of the afferent nerve fibers and showed no marked dependence on temperature. This contrasts markedly with the known negative temperature coefficient of the DDT- or allethrin-induced repetitive activity in the lateral-line organ.

76-0239. Bai, K. M.; Bhavnagary, H. M.; Majumder, S. K. (Central Food Technol. Res. Inst., Mysore 570013, India). **Enhancement of magnesium ammonium arsenate toxicity to rats.** *Pestic. Sci.* 5(5): 527-534; 1975. (13 references)

The toxicity of magnesium ammonium arsenate (MAA), in combination with various reducing and acid producing agents, was tested against the species of *R. norvegicus* (albino Wistar strain) and *R. rattus* (roof rat) by forced feeding and *ad libitum* methods under the conditions of cage and rattery, where semi-natural conditions prevailed. MAA at 300 mg/kg did not result in any mortality. The higher doses of 450 and 600 mg/kg killed 50 and 75% of 12 test animals, respectively. In combination with sodium sulfite, potassium iodide, and urea, MAA resulted in higher mortalities and decreased time of death. The best result was obtained with potassium iodide as all test animals were killed within 24 hr when this was combined with MAA at 450 mg/kg. Also at 450 mg/kg, the addition of urea and sodium sulfite resulted in the death of all animals within 28 hr. However, the addition of the reducing agents to MAA at 600 mg/kg did not enhance its activity. The reducing agents when used alone against the rats were not toxic to them, except for potassium iodide which gave a 50% mortality when used at the highest dosage of 849.6 mg/kg. MAA at 2% in bait without any other agent was accepted by Wistar rats but only killed 50% of them. The average lethal intake was 176.4 mg/kg. The addition of sodium sulfite enhanced the mortality. Urea also improved toxicity of MAA, but the acceptance was slightly affected. The response of roof rats to 2% MAA was similar. Sodium sulfite with MAA was comparatively more effective against these animals. The combinations of urea and MAA decreased the time of death, with lower intake as compared to controls. Through the use of rattery trials it was learned that sodium sulfite and urea, each in combination with MAA, resulted in higher mortalities of both Wistar and roof rats. Histidine in combination with MAA has a remarkable effect on Wistar rats when force fed. Even at 300 mg/kg, histidine intensified the toxicity of MAA to such an extent that 75% of the animals were killed. Histidine effect was more noted at 300 and 450 mg/kg than at the dose of 600 mg/kg. Histidine did not affect the palatability of the food. Roof rats were killed at a faster rate with this combination. The results of this study suggest that the

incorporation of sodium sulfite, urea, or histidine in 2% MAA bait could be beneficial in increasing its effectiveness against rodent populations.

76-0240. Sharma, R. P.; Watanabe, P. G. (Dep. Vet. Sci., Utah State Univ., Logan, UT 84322). **Time related disposition of tri-*o*-tolyl phosphate (TOTP) and metabolites in chicken.** *Pharmacol. Res. Commun.* 6(5): 475-484; 1974. (10 references)

Time dependent distribution of (^{32}P)-tri-*o*-tolyl phosphate (TOTP, TOCP) and its metabolites was studied after oral administration in chickens. White Leghorn hens, 1.5 yr old, received 0.77 g/kg TOTP by crop intubation. Groups of 3 animals were sacrificed by cervical dislocation at 1, 4, 12, 24, 48, and 72 hr after TOCP administration. Excreta was collected from the 72 hr group. The results of the study indicated that the total concentration of TOTP and metabolites in liver consistently increased throughout the 72 hr period. Since the proportion of TOTP with respect to total radioactivity decreased after 12 hr, the overall increase was reflected primarily by the increase of metabolite 1 (CBDP), which represented 71 and 74% of the total concentration at 48 and 72 hr, respectively. The hydroxylated metabolites of TOTP and CBDP were minor constituents of the total liver concentration. The dihydroxy derivative of TOTP was present in insignificant amounts in the liver. Plasma showed even lower concentrations. At 24 hr, plasma concentration represented only 5% that of the liver. The absolute and proportional levels of TOTP and metabolites in the plasma changed little over 24 hr. TOTP was the primary compound detected and comprised about 80% of the total value. The finding of lower concentrations in plasma compared to the liver suggested that CBDP is bound to tissue to a greater extent than TOTP. Such a suggestion is further supported by the finding of a low concentration of CBDP in plasma. TOTP was the major circulating compound. A constant rise in liver concentrations of CBDP throughout the 72 hr period further substantiates the fact that this compound was bound to the liver in some manner. Such binding may account for an increase in radioactivity in various visceral organs and nervous tissue for several days following a single oral dose of ^{32}P-TOTP which was reported in an earlier study. It is inferred that following the hydroxylation of TOTP, cyclization may occur in plasma or in tissues but the resulting metabolite (CBDP) accumulates in tissues because of an increased affinity to the tissue components. This correlates with the delayed neurotoxic effect of TOTP following single exposure. The separation of labeled compounds in the pooled excreta over 72 hr showed 99% of the activity associated with unmetabolized TOTP. The total recovery over 3 days was relatively low, emphasizing the extended time this chemical remains within the body.

76-0241. Hickenbottom, J. P.; Yau, E. T. (Sch. Pharmacy, Univ. Mississippi, University, MS 38677). **Effects of dichlorodiphenyltrichloroethane (DDT) on liver glycogen metabolism in rats.** *Pharmacologist* 16(2): 255; 1974.

Male Holtzman rats were given an acute dose of DDT. The effect on liver glycogen, phosphorylase, synthetase, and glucose-6-phosphatase were observed. Fluorimetric assay of glucose was used to determine glycogen. Phosphorylase and synthetase activities were measured by the incorporation of glucose-C^{14} from C^{14}-glucose-1-phosphate and C^{14}-uridine diphosphoglucose, respectively, into glycogen. Glucose-6-phosphatase activity was measured by the release of inorganic phosphate. The glycogen level in the liver was significantly decreased at 18 hr after treatment with DDT, 50 mg/kg i.p., and was accompanied by an increase in the phosphorylase and glucose-6-phosphatase activities. Synthetase activity was decreased. Each enzyme responded maximally to different doses of DDT. Phosphorylase and synthetase were affected only by the *p,p'*-isomer of DDT. Both *p,p'*-DDT and *o,p'*-DDT stimulated glucose-6-phosphatase. Treating adrenalectomized rats caused changes similar to those observed in intact rats. This finding suggests that the changes induced by DDT were not mediated through glucocorticoids.

76-0242. Gupta, K. G.; Sud, K.; Aggarwal, P. K.; Aggarwal, J. C. (Dep. Microbiol., Panjab Univ., Chandigarh, India). **Effect of baygon (2-isopropoxyphenyl *N*-methylcarbamate) on some soil biological processes and its degradation by a *Pseudomonas* sp.** *Plant Soil* 42(2): 317-325; 1975. (28 references)

The effect of baygon on ammonification, nitrification, phosphorus solubilization and carbon dioxide evolution in soil and its degradation by a *Pseudomonas* are discussed. The levels of baygon used in applications for the study of processes of carbon dioxide evolution, nitrification, ammonification, and phosphorus solubilization were 0, 25, 125, and 1250 ppm. Baygon inhibited nitrification for 4 weeks at 25 ppm and for 16 weeks at 1250 ppm. At 1250 ppm the oxidation of ammonium formed from peptone was not complete in 16 weeks. Baygon did not affect the solubilization of tricalcium phosphate. Carbon dioxide production from soil was depressed for 10 days. The addition of glucose caused a higher depression of carbon dioxide production after a week. Baygon (propoxur) was degraded to 2-isopropoxyphenol by a *Pseudomonas* sp.

76-0243. Cegla, U. H.; Kroidl, R. F.; Kronberger, H.; Weber, H. (Sekt. Pulmonol., Zentr. Innere Med. Kinderheilk. Univ., 79 Ulm/Donau, Germany). **Tierexperimentelles Modell einer Lungenfibrose bei der Ratte mittels Paraquatinjektion. [Lung fibrosis produced in rats by means of paraquat injection.]** *Pneumonologie* 152(1-3): 65-74; 1975. (17 references) (German)

Histological findings in an experimental lung fibrosis induced by single or multiple i.p. injections of paraquat in Siv and Sprague-Dawley rats are present. More or less pronounced thickening of the alveolar septa due to the infiltration of plasmocytes, lymphocytes, and monocytoid cells were found in the lung of resistant Siv rats 8 days after the injection of a single 8 mg/kg dose of paraquat. The findings indicate interstitial inflammation of the pulmonary parenchyma without proliferation of the connective tissue. Single and multiple i.p. injections of paraquat induced septal thickening due to the infiltration of plasmocytes, monocytic cell elements, lymphocytes, histiocytes, and fibroblasts, an alternately focal and con-

tinuous proliferation of the collagen connective tissue with destruction of the parenchymal structure, and atelectases in more sensitive Sprague-Dawley rats. The proliferation of the connective tissue was most pronounced in animals injected with three 5 mg/kg, 7.5 mg/kg, and 10 mg/kg doses at weekly intervals, and in those injected with four 5 mg/kg doses at weekly intervals. The findings indicate considerable differences in the susceptibility within the same species, and that paraquat is not a "hit and run" poison. The three well-known stages of lung alterations (hyperemia, exudative alterations in the interstitium, protein-rich edema with necrosis of the alveolar and bronchiolar epithelium; a transitory stage with increasing interstitial proliferation; and a late stage with fiber formation of the alveolar delomorphous cells and of the bronchiolar epithelium) were clearly seen.

76-0244. Griffin, C. S. (Pyrethrum Bureau, Nakuru, Kenya). **Mammalian toxicology of pyrethrum.** *Pyrethrum Post* 12(3): 50-58; 1973. (58 references)

Pyrethrum has been used medically for over 50 yr with no death ever directly attributed to its use. Toxicological studies have been performed using the commercial grades, an 80% pyrethrin concentrate, and the isolated pyrethrin components. Female rats on a 5 week diet containing 8,000 ppm pyrethrins ingested the equivalent of 911 mg pyrethrins/kg/day. The only macroscopic pathological finding was prominent Peyer's patches in the ileum of one rat. In rats ingesting 400 ppm pyrethrins and 2,000 ppm piperonyl butoxide, the average daily consumption for females was 35 mg/kg pyrethrins and 175 mg/kg for PB. For males the figures were 42 mg/kg and 208 mg/kg, respectively. The only macroscopic pathological observation was a small cecal enlargement in most rats. In six beagle dogs fed for 90 days on a diet containing 5,000 ppm pyrethrins, for 130-200 mg/kg/day ingestion, toxicity signs included tremors, ataxia, labored respiration, and salivation during the first month of experimentation. Dermal toxicity studies produced no compound-related effects. For inhalation studies, measured doses of product were released into a discrete space, to which test animals were introduced for controlled periods. Pin-point hemorrhages were found on the lung surfaces of the majority of rats tested. No histopathological abnormalities were noted in the liver, kidney, or spleen. Toxicity after administration by parenteral routes appeared to increase by solvents. Administration by the i.v. route is the most toxic for pyrethrins which are thought to reach the nerve synapses before catabolism has occurred. Slight ocular irritancy was determined. The pyrethrum flower is thought to contain 2 allergens, pyrethrosin and saline-soluble fraction. The latter is removed during refining, and the low kerosene solubility of pyrethrosin ensures its absence from pale extract. In teratogenic and reproductive studies 18 albino rats were fed a diet containing 5000 ppm pyrethrins, starting 3 weeks prior to first mating. The weights of the weanlings were significantly lower than controls. The reproductive performance of the parents was not affected. Pyrethrins have been found to be non-mutagenic. Mammalian metabolism of pyrethrins is considered. Toxicity of synergists, diluents, and propellents is discussed.

76-0245. Bond, H.; Mauger, K.; DeFeo, J. J. (Dep. Med. Chem., Coll. Pharmacy, Univ. Rhode Island, Kingston, RI). **The oral toxicity of pyrethrum, alone and combined with synergists and common drugs, and pathological effects produced.** *Pyrethrum Post* 12(3): 59-63; 1973. (1 reference)

Various oral doses of pyrethrins (20% solution), synergists, alcohol, acetylsalicylic acid, caffeine, nicotine, and phenobarbital alone and combined were given to male and female rats in an effort to determine LD50 values. According to the values obtained in this part of the study, doses were then selected for daily administration of the same substances for 90 days. The comparatively high LD50 value for 20% pyrethrins solution, 7,200 mg/kg (1,440 mg pyrethrins a.i./kg), gives indication of its very low toxicity. When combined with each of the other drugs and chemicals with the exception of phenobarbital and nicotine, the LD50 decreased. The results of this study allow the conclusion that pyrethrins and Tropital, a pyrethrin synergist, are the least toxic of the insecticidal substances.

76-0246. Desaiah, D.; Cutkomp, L. K.; Koch, R. B. (Dep. Entomol., Fisheries and Wildlife, Univ. Minnesota, St. Paul, MN 55101). **The effect of pyrethrins on ATPases cockroach and blue gillfish.** [*sic*] *Pyrethrum Post* 12(3): 70-75; 1973. (29 references)

A study was designed to determine the effects of pyrethrins on the ATPase enzyme system. The ATPases from nervous tissue and muscle of cockroaches were used in in vitro and in vivo studies. Pyrethrins were also studied for in vitro effects in fish brain. Pyrethrins inhibited Na^+-K^+ ATPase in vitro from cockroach nerve cord at 5.9 μM and mitochondrial Mg^{2+} ATPase at 21.6 μM. In fish brain homogenate both enzymes were inhibited, but at somewhat higher concentrations. Cockroaches injected with 0.5 μg pyrethrins demonstrated a 67 and 35% reduction of mitochondrial Mg^{2+} ATPase from nerve cords at 3 and 5 hr, respectively, after treatment. A lesser effect was noted on Na^+-K^+ ATPase. Pyrethrin injection affected the Mg^{2+} ATPase in muscle, but was opposite to the response noted for nerve cord Mg^{2+} ATPases. The in vitro effect of pyrethrins on the ATPase enzyme system is clearly distinguishable from that of DDT and related compounds, primarily because of the greater sensitivity to pyrethrins of Na^+-K^+ ATPase from cockroach nerve cords.

76-0247. Saxena, P.; Saxena, C. (Dep. Zool., Univ. Rajasthan, Jaipur, India). **Effect of pyrethrum on body and organ weights, food consumption and faeces production of the house sparrow, *Passer domesticus* (L.).** *Pyrethrum Post* 12(3): 76; 1973. (1 reference)

The toxicity of pyrethrum to the common house sparrow, *Passer domesticus* (L.), was investigated. Doses of 2, 3, and 4 mg/g of pyrethrum powder containing 1.3% pyrethrins (26, 39, and 52 mg pyrethrins/kg) were administered orally after mixing the required quantity of pyrethrum with bajra grains. Eight days of treatments were allowed. Eight days after the final treatment the birds were autopsied and organ weights recorded. Food consumption, feces production, body weight and organ weight

were lower in sparrows treated with pyrethrin powder (4 mg/g) than in controls. Greater flying tendency, hyperexcitability and loud chirping were also observed. No changes were noted among birds treated with 2 and 3 mg. It is suggested that pyrethrum, at the highest dose, may have affected the hypothalamus.

76-0248. Murado-Garcia, M. A.; Baluja-Marcos, G. (General Organic Chemistry Institute, Madrid, Spain). **Estudio de algunas caracteristicas del proceso de transformacion de aldrin por ciertos microorganismos del suelo. [Study of some characteristics of aldrin conversion as effected by certain soil microorganisms.]** *Rev. Agroquim. Technol. Aliment.* 14(1): 85-90; 1974. (10 references) (Spanish)

Five species of common soil fungi were cultured in the presence of variable concentrations of aldrin, so as to study the characteristics of aldrin conversion by the fungi. Results were quantified by GLC and by liquid scintillation (using aldrin tagged with carbon-14). The initial concentration of aldrin influences the intensity of the conversion process and also the percentage of hydrophilic metabolites produced.

76-0249. Mathur, S. P.; Morley, H. V. (Soil Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, Canada). **A biodegradation approach for investigating pesticide incorporation into soil humus.** *Soil Sci.* 120(3): 238-240; 1975. (7 references)

A strain of *Aspergillus versicolor* known to produce a humic-acid-like polymer was cultured in Fernbach flasks for 10 weeks. At 16, 22, 28, and 30 days after inoculation, 2 ml of ethanol with or without 4 mg of methoxychlor was added to the flasks. The turf pathogen *Marasmius oreades* Bolt. Fr. was then employed to bring about partial degradation of the humic acids (HA) and methoxychlor-HA (the HA obtained from the pesticide-enriched cultures above) in replacement stationary cultures. During 2 weeks of incubation with Marasmium, the HA and methoxychlor-HA were utilized to the extent of 23.4 and 25%, respectively. The benzene extract of the cultures incubated with the methoxychlor-HA showed a significant amount of methoxychlor on gas chromatography; 6.25 mg of HA utilized by the Marasmius released 4.18 g of methoxychlor. The data suggests that even relatively nonlabile pesticides such as methoxychlor may be incorporated into soil humic materials.

76-0250. Mathur, S. P.; Saha, J. G. (Soil Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario, Canada). **Microbial degradation of lindane–C^{14} in a flooded sandy loam soil.** *Soil Sci.* 120(4): 301-307; 1975. (21 references)

The microbial degradation of lindane was studied in a soil to which chlorinated hydrocarbons had not been applied for a considerable length of time. The soil used in this study was a submerged sandy loam, which had been covered with plastic sheets since 1962 and to which no pesticides had been applied. Lindane-C^{14} was found to degrade slowly in the soil which was incubated for 6 weeks under flooded conditions. After 6 weeks, 90% of the lindane was recovered. The degradation products were isolated and identified using gas chromatography and mass spectrometry. The major product was γ-3,4,5,6-tetrachlorocyclohexane at yields greater than 5%, followed by γ-2,3,4,5,6-pentachlorocyclohex-1-ene at yields of less than 2%, and small amounts of 1,2,4-trichlorobenzene, 1,2,3,5- and/or 1,2,4,5-tetrachlorobenzene, and 1,2,3,4-tetrachlorobenzene. Although chlorophenolic metabolites of lindane have been observed in plants, insects, and mammals, none were observed in soil.

76-0251. Preache, M. M.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Effects in mice of high and low environmental temperature on the maternal and fetal toxicity of 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) and on disposition of [^{14}C]-dinoseb.** *Teratology* 12(2): 147-156; 1975. (20 references)

Swiss-Webster female mice were treated with 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) and maintained in an increased environmental temperature (32° C) for 24 hr or a decreased temperature (0-6° C) for 1.5-4 hr. In two experiments animals maintained at low temperature were kept wet during the cold exposure, to enhance the reduction in body temperature, by rinsing them with water at approximately 30 min intervals. Results from nonpregnant females indicated that increased temperature lowered the LD50 for single injections of dinoseb from 20.2 to 14.1 mg/kg and that reduced temperature for 4 hr had no effect on the LD50. A 24 hr exposure to 32° C enhanced the effect of 3 daily dinoseb treatments of pregnant mice; it increased maternal mortality, decreased fetal body weight, and increased frequency of fetal anomalies. Fetal body weight and the frequency of malformations were the same in groups exposed to low temperature and maintained at room temperature. Disposition of [^{14}C] dinoseb was also determined in nonpregnant mice exposed to temperatures of 0, 24, and 32° C. The periods of environmental temperature studied (3-24 hr) had no effect on the rate of disappearance of dinoseb from plasma or other tissues examined.

76-0252. Eroschenko, V. P.; Wilson, W. O. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID 83843). **Photoperiods and age as factors modifying the effects of kepone in Japanese quail.** *Toxicol. Appl. Pharmacol.* 29(3): 329-339; 1974. (33 references)

Immature Japanese quail (*Corturnix corturnix japonica*) of both sexes fed 200 ppm of the insecticide Kepone (chlordecone), when exposed to 16 hr of light per day, had significantly enlarged reproductive organs, livers and adrenal glands. After a reduction in the photoperiod, high mortality occurred in only the birds previously fed Kepone. Administration of Kepone to adult females while egg-laying did not affect the weight of reproductive organs or livers. In adult males of the same age testes and livers were greatly enlarged. In both sexes of adult birds, the adrenals were enlarged. Subsequent exposure to reduced photoperiod of the Kepone-fed adult quails of both sexes

produced no mortality. In males fed Kepone, testicular regression was recorded much earlier than in controls. Previous ingestion of Kepone affected neither the cessation of egg-laying nor the regression of the ovary. Kepone exerted its effects primarily on the immature quail of both sexes and to a lesser degree on adults. An estrogenic action of Kepone was indicated by increased oviduct weight of young females on a photoperiod of 6 hr light and 18 hr dark per day. In adult males the major estrogenic effect was increased liver weight. (Abstract by permission)

76-0253. Robinson, C. P.; Smith, P. W.; Zelenski, J. D.; Endecott, B. R. (Coll. Pharm., Univ. Oklahoma, Norman, OK 73069). **Lack of an effect of interference with amine mechanism on the lethality of chlordimeform in the rat.** *Toxicol. Appl. Pharmacol.* 33(2): 380-383; 1975. (21 references)

The effects of blocking α-adrenergic receptors, serotonergic receptors, or both types of receptors, and of depleting tissue stores of serotonin and norepinephrine on the LD50 of chlordimeform were examined in male rats. Rats were divided into 5 groups of 40 animals each. One group received reserpine 48 hr (2.5 mg/kg) and 24 hr (1 mg/kg) prior to the administration of chlordimeform to deplete norepinephrine and serotonin from tissue stores. Three other groups received methysergide (3 mg/kg), phentolamine (10 mg/kg), or both to block serotonergic, α-adrenergic, or both receptors, respectively. The controls received no drug prior to the injection of chlordimeform. The animals that died after chlordimeform poisoning did so in a fairly short time. The length of time between injection and death was dose-related. Rats pretreated with the amine receptor blockers died more quickly than did controls. Blockage of α-adrenergic or serotonergic receptors or both, did not decrease the mortality induced by chlordimeform, while the decreased lethality seen after amine depletion by reserpine was not statistically significant. It was concluded that serotonergic and α-adrenergic receptor blocking agents would be of little antidotal value in treating persons poisoned with chlordimeform unless marked species differences exist.

76-0254. Black, W. D.; Talbot, R. B.; Wade, A. E. (Dep. Biomed. Sci., Ontario Vet. Coll., Univ. Guelph, Guelph, Ontario, Canada). **A study of the effect of ovex on parathion and paraoxon toxicity in rats.** *Toxicol. Appl. Pharmacol.* 33(3): 393-400; 1975. (14 references)

One hundred forty rats were treated with ovex (*p*-chlorophenyl *p*-chlorobenzenesulfonate) 100 mg/kg orally, paired with an equal number of controls, grouped (20 treated and 20 control) and designated as 12, 24, 48, 72, 96, 240, and 360 hr. Ten treated and ten control were given a lethal dose of parathion (100 mg/kg, oral) at the designated times after ovex and the length of survival recorded. Similar groups were killed at the designated times and the liver wt/body wt ratio and α-naphthyl acetate hydrolyzing activity of 9000X *g* liver supernate determined. Significant increases in liver wt/body wt ratio and α-naphthyl acetate hydrolyzing activity were observed. When the above increases in liver size and enzyme activity were combined and expressed as a percentage, peak activity was seen at 72 hr (181%) and was present up to 240 hr (129%). Ovex (100 mg/kg oral) pretreatment appeared to provide more protection against parathion than paraoxon toxicity. It increased the rate of parathion metabolism by whole liver homogenates but had only a marginal effect on the rate of metabolism of paraoxon ($p < 0.10$). Ovex treatment reduced the liver organophosphate content of parathion but not paraoxon-exposed rats. An effect of ovex on plasma and brain organophosphate concentrations was not determined. (Author abstract by permission)

76-0255. Bus, J. S.; Preache, M. M.; Cagen, S. Z.; Posner, H. S.; Eliason, B. C.; Sharp, C. W.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Fetal toxicity and distribution of paraquat and diquat in mice and rats.** *Toxicol. Appl. Pharmacol.* 33(3): 450-460; 1975. (29 references)

Administration of paraquat in mice, 1.67 and 3.35 mg/kg ip or 20 mg/kg po daily on Days 8-16 of gestation induced no significant teratogenic effects, although a slight increase in nonossification of sternebrae was observed. Radioactivity reaching the mouse embryo after ip or po administration of [^{14}C]paraquat on Day 11 of gestation was low. The fetal toxicity of diquat in rats, as measured by the number of dead and resorbing fetuses, was greater than that caused by paraquat after 15 mg/kg iv doses on various days of gestation, which correlated with higher fetal concentrations of [^{14}C]diquat compared to [^{14}C]paraquat. In perinatal organ distribution studies, more radioactivity from [^{14}C]paraquat was retained in lung tissue of postnatal mice and rats than that in liver and kidney tissue. In prenatal studies, however, [^{14}C]paraquat was retained in lung tissue of fetal rats after maternal administration of paraquat on Day 21 of gestation but not in lung tissue of fetal mice after paternal paraquat on Day 16 of gestation. This may be indicative of prenatal development of binding sites or of an active transport process for the uptake of paraquat into the lung or that elevated oxygen tensions in postnatal lungs contributes to paraquat retention in lung tissue. (Author abstract by permission)

76-0256. Bus, J. S.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Postnatal toxicity of chronically administered paraquat in mice and interactions with oxygen and bromobenzene.** *Toxicol. Appl. Pharmacol.* 33(3): 461-470; 1975. (21 references)

The purpose of this study was to investigate the effect of chronic paraquat administration on developing mice and to examine the interaction of chronic paraquat exposure with 100% oxygen and the hepatotoxin bromobenzene. Paraquat was administered at 50 and 100 ppm in the drinking water to pregnant mice beginning at Day 8 of gestation, with continued exposure to the newborns up to 42 days after birth. Neither paraquat treatment altered the postnatal growth rate; however, 100 ppm but not 50 ppm paraquat significantly increased the postnatal mortality. Both 50- and 100-ppm paraquat-treated mice were sensitized to the onset of oxygen toxicity, determined by a significant reduction in the LT50 at 42 days

after birth. An enhanced sensitivity to oxygen toxicity was also detectable in 100 ppm but not 50 ppm mice at Days 1 and 28 after birth. In 42-day-old mice, 50 and 100 ppm paraquat treatment also significantly reduced the LT50 after 3100 mg/kg ip (LD85) bromobenzene. These observations suggest that the toxicity of paraquat may be mediated through an interaction with oxygen and describe possible interactions that could occur with the environmental use of paraquat. (Author abstract by permission)

76-0257. Hodgson, J. R.; Hoch, J. C.; Castles, T. R.; Helton, D. O.; Lee, C. C. (Pharmacol. Toxicol., Midwest Res. Inst., Kansas City, MO 67110). **Metabolism and disposition of ferbam in the rat.** *Toxicol. Appl. Pharmacol.* 33(3): 505-513; 1975. (9 references)

Approximately 40-70% of an oral dose of ferric [^{35}S]dimethyldithiocarbamate ([^{35}S]ferbam) or ferric [^{14}C]dimethyldithiocarbamate ([^{14}C]ferbam) was absorbed through the gastrointestinal tract of the rat during a 24-hr period. In rats receiving [^{35}S]ferbam, 22.7, 18.1, and 1.0% of the radioactivity was found in urine, expired air, and bile, respectively. Only small amounts of ^{35}S were found in the various tissues, including blood, kidneys, muscle, and brain. In rats receiving [^{14}C]ferbam 42.9 and 1.4% of the ^{14}C was found in the urine and bile, respectively; whereas only 0.6% of the radioactivity was recovered in the expired air. The other tissues contained only small amounts of ^{14}C. Analysis of expired air indicated that the only expired ferbam metabolite was carbon disulfide. Major metabolites in the urine included inorganic sulfate, a salt of dimethylamine and glucuronide conjugate of dimethyldithiocarbamate. Unchanged ferbam was not excreted in the urine. In pregnant rats given [^{14}C]ferbam a small but significant amount of radioactivity readily crossed the placenta into the fetus. In lactating rats given [^{14}C]ferbam, radioactivity was secreted into milk, absorbed by the pups and excreted in the pups' urine. (Author abstract by permission)

76-0258. Ballantyne, B.; Gazzard, M. F.; Robson, D. C.; Swanston, D. W. (Minist. Defense, Sect. Toxicol. Pathol., Med. Div., Chem. Defense Estab., Porton Down, Wiltshire, England). **Concentrations of 2-hydroxyiminomethyl-N-methylpyridinium ion in plasma and aqueous humor as indices of the toxicity of pralidoxime mesylate (P2S) for the rabbit.** *Toxicol. Appl. Pharmacol.* 33(3): 559-567; 1975. (21 references)

Plasma pralidoxime mesylate (P2S) concentrations were measured at various times up to 2 hr in female rabbits after a single injection of the im LD50 (258 mg/kg) or iv LD50 (118 mg/kg). The results indicate that plasma P2S concentrations at death are generally greater than 200 μg/ml; plasma concentrations of 90-160 μg/ml, if maintained for a few minutes, are not lethal, but if sustained, then an abrupt rise in concentration may occur with death ensuing at concentrations greater than 200 μg/ml; sustained plasma concentrations of 90 μg/ml or less are not lethal. P2S was present in measurable amounts in the aqueous humor, but always at concentrations lower than in plasma. In a separate study to define the relationship between plasma and aqueous humor P2S concentrations, rabbits were sacrificed after receiving 50% the im LD50 (129 mg/kg). At 5 min, P2S was detected in aqueous humor in concentrations 5-15% that in plasma. Peak aqueous humor concentrations were measured at 1 hr, at which time the plasma concentrations had decreased to similar values. Thereafter, plasma and aqueous humor concentrations declined at similar rates. Rabbits having im P2S injections of 40 mg/kg showed increases in intraocular tension, significant at 1 hr after injection and persisting for a further 4 hr. (Author abstract by permission)

76-0259. Statham, C. N.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233). **Potentiation of the acute toxicity of several pesticides and herbicides in trout by carbaryl.** *Toxicol. Appl. Pharmacol.* 34(1): 83-87; 1975. (21 references)

Coexposure of rainbow trout to a nonlethal concentration of carbaryl (Sevin) significantly increased the acute toxicity of 2,4-D *n*-butyl ester, dieldrin, rotenone, and pentachlorophenol. Arecoline, a direct acting cholinergic agent, was also capable of enhancing the toxicity of the compounds tested. Exposure to atropine before and during exposure to either carbaryl or arecoline prevented the potentiation seen with these latter compounds. Ganglionic and adrenergic blocking agents were incapable of preventing the effect of carbaryl. These studies indicate that the potentiation produced by carbaryl may be related to its muscarinic activity. (Author abstract by permission)

76-0260. Reischl, P.; Van Gelder, G. A.; Karas, G. G. (Behav. Toxicol. Lab., Vet. Diagn. Lab., Coll. Vet. Med., Iowa State Univ., Ames IA 50010). **Auditory detection behavior in parathion-treated squirrel monkeys (*Saimiri sciureus*).** *Toxicol. Appl. Pharmacol.* 34(1): 88-101; 1975. (35 references)

Effect of the organophosphorus insecticide parathion on auditory detection behavior in squirrel monkeys (*Saimiri sciureus*) was investigated. Eight male squirrel monkeys were assigned to two groups and systematically exposed to daily oral doses of technical parathion. There were four monkeys in the control group and four in the 0.1-mg/kg group. The exposure period was 148 days. The control group received placebos for the entire 148 days. Prior to dosage assignment the monkeys were adapted to the laboratory and trained to bar-press in response to a 0.1-sec tone for hearing threshold testing. Daily threshold testing employed the method of constant stimuli. Hearing thresholds were determined at 500, 1000, 200, 4000, 8000, and 16,000 Hz. Parathion exposure began after the eight monkeys were divided into two, four-animal statistically matched groups based on stable baseline hearing threshold data. An analysis of variance was performed on hearing thresholds and standard deviations of hearing thresholds. The parathion-exposed groups showed a significant ($p < 0.025$) increase in the standard deviation of hearing thresholds after 40 days of parathion exposure. The magnitude of the standard deviation continued to grow for 54 additional days and thereafter declined. Mean hearing thresholds between the control and exposed groups did not vary significantly. It was concluded that daily oral doses of parathion at 0.1 mg/kg caused a decrement in the squirrel monkey's tone-reporting behavior

during hearing threshold testing. (Author abstract by permission)

76-0261. Ecker, J. L.; Gibson, J. E.; Hook, J. B. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **In vitro analysis of the renal handling of paraquat.** *Toxicol. Appl. Pharmacol.* 34(1): 170-177; 1975. (13 references)

Accumulation of paraquat by mouse renal cortical slices was related to the concentration of paraquat in the medium and the duration of incubation. Paraquat accumulation was depressed by incubation of slices under nitrogen or by addition of metabolic inhibitors. Accumulation of a second organic base, *N*-methylnicotinamide (NMN), was depressed by a concentration of paraquat which failed to influence accumulation of the organic acid, *p*-aminohippurate (PAH). The uptake component of NMN accumulation was inhibited by paraquat. The data suggest that paraquat is accumulated by an energy-requiring process and that this accumulation occurs via the organic base transport system. In addition, an apparently toxic effect of paraquat on cortical slice function was observed when the incubation temperature was raised from 25 to 37°C. At this temperature, paraquat deressed not only NMN accumulation but PAH accumulation and slice oxygen consumption as well. Thus, paraquat can be toxic to the function of kidney slices and this effect appears to be temperature-dependent. (Author abstract by permission)

76-0262. Ecker, J. L.; Hook, J. B.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Nephrotoxicity of paraquat in mice.** *Toxicol. Appl. Pharmacol.* 34(1): 178-186; 1975. (16 references)

The nephrotoxicity of paraquat was evaluated by estimated renal function in vitro and in vivo in surviving mice 24 hr after an LD50 (7 day) dose of the herbicide. Proximal tubular function was monitored in vitro by measuring accumulation of *p*-aminohippurate (PAH) and *N*-methylnicotinamide (NMN) into renal cortical slices. Disappearance of phenolsulfonphthalein (PSP) and [^{14}C]-paraquat from plasma was used to monitor tubular function in intact animals. Glomerular function was approximated using disappearance of iothalamate from plasma. Renal cortical accumulation of PAH and NMN in vitro was not markedly altered following paraquat poisoning. In contrast, dramatic effects were measured in vivo. The rate of disappearance of both [^{14}C]-paraquat and PSP from plasma was significantly reduced in poisoned mice. In contrast, the rate of disappearance of iothalamate was not affected by paraquat. However, the concentration of iothalamate was higher in the plasma of treated animals, suggesting that paraquat poisoning results in smaller volume of distribution for iothalamate but fails to alter glomerular filtration. Thus, the functional nephrotoxicity due to paraquat appears to be restricted to the proximal nephron. Elimination of paraquat is primarily via the kidney and likely involves active secretion into the urine. Since secretion requires concentration within the cells of the proximal tubules, it follows that toxic concentrations of herbicide might be reached in this area of the nephron. Furthermore, it follows that, should toxic concentrations of paraquat be reached in the kidney, subsequent impairment of renal function would impede elimination of the drug, leading to more profound toxicity in organs than other than the kidney. (Author abstract by permission)

76-0263. Davidson, P. P. (Sch. Pharm., Auburn Univ., Auburn, AL 36830). **Dietary fat alteration of plasma cholinesterase response to malathion.** *Toxicology* 5(1): 113-115; 1975. (4 references)

Male Sprague-Dawley rats were maintained for 5 weeks on a fat-free diet, a normal commercial diet (4.5% fat), or a high-fat diet (45% fat). After 5 weeks, the animals were treated s.c. with 200 mg/kg malathion; a control group which had been fed the commercial diet was not given malathion. Three days later, the animals were again injected with malathion. The plasma cholinesterase levels were determined before the first pesticide treatment and 6 hr after each treatment. The first dose of malathion inhibited blood cholinesterase to the greatest extent in the rats fed the commercial diet and to the least extent in the rats fed the high-fat diet; the effects on the animals given the fat-free diet were intermediate between those of the other groups. After the second dose of malathion, the fat-free and commercial groups showed a similar blood cholinesterase response and the high-fat group showed a significantly reduced responsiveness. The blood cholinesterase levels were increased over control values in the fat-free group prior to malathion dosing.

76-0264. Khera, K. S.; Villeneuve, D. C. (Health Protect. Branch, Natl. Health Welfare, Ottawa, Ontario, Canada). **Teratogenicity studies on halogenated benzenes (pentachloro-, pentachloronitro-, and hexabromo-) in rats.** *Toxicology* 5(1): 117-122; 1975. (4 references)

Female Wistar rats were treated with hexabromobenzene (HBB), pentachlorobenzene (QCB), or pentachloronitrobenzene (PCNB) (50-200 mg/kg given by stomach tube) daily during days 6-15 of gestation. The rats were killed on day 22 of gestation and their viscera, uteri, and fetuses examined for pathological changes and, in the case of the fetuses, viability. There were no overt signs of toxicity in the pregnant females. nor did the 3 compounds cause any significant reductions in the mean number of live fetuses/litter or the ratio of fetal death to total implants. All doses of QCB also increased the incidence of extra ribs in the fetuses in a dose-dependent fashion, and the 200 mg/kg dose increased the incidence of sternal defects. PCNB and HBB produced no significant changes.

76-0265. Nikolaev, P. I. (Author address not given). **Nekotorye dannye po toksichnosti khlorofosa i amidofosa dlya loshadey. [Toxicity of chlorophos and amidophos to horses.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit.* 44: 84-90; 1972. (Russian)

Studies were performed on the toxicity of trichlor-

fon and amidophos, administered through a stomach tube or applied on the skin by a pour-on technique. When administered in single doses of 50-125 mg/kg through a stomach tube, trichlorfon caused no clinical poisoning symptoms, and neither did amidophos when administered in doses of 20-60 mg/kg. A trichlorfon dose of 125 mg/kg and an amidophos dose of 60 mg/kg, however, caused slight poisoning symptoms in hot weather. Pronounced poisoning symptoms were caused by 150 mg/kg doses of trichlorfon, and by 80 mg/kg doses of amidophos: intensified peristalsis, slight depression, increased excitability, reduced milk production, and reduced heart rate. The 150 mg/kg dose of trichlorfon and the 80 mg/kg dose of amidophos inhibited the cholinesterase activity by 65% and 57%. Normalization of the enzyme activity occurred after 13-15 days. When applied externally, the highest ineffective doses were determined to be 120 mg/kg for trichlorfon, and 130 mg/kg for amidophos, while the subthreshold doses were 240 and 160 mg/kg, respectively. Increased resistance of the animals to these substances was observed after repeated oral administration 20-30 days later. The optimal single oral doses are 70-80 mg/kg for trichlorfon and 50-55 mg/kg for amidophos.

76-0266. Marking, L. L. (Fish Control Lab., La Crosse, WI 54601). **Toxicity of 2-(digeranylamino)-ethanol, a candidate selective fish toxicant.** *Trans. Am. Fish. Soc.* 103(4): 736-743; 1974. (21 references)

Toxicity to a variety of cold- and warmwater fish of 2-(digeranylamino)-ethanol was tested in the laboratory and in outdoor plastic pools. The chemical was more toxic to carp, *Cyprinus carpio*, than to other warmwater fish. In a period of 96 hr, 50% mortality for carp was achieved using a concentration of 0.0507 mg/liter. The corresponding values for centarchids ranged from 0.237 mg/l for smallmouth bass, *Micropterus dolomieui*, to 0.720 mg/l for bluegill, *Lepomis macrochirus*. In cold water (12°C) the chemical was significantly less toxic to bluegill than in warmer water (17-22°C). It is more toxic in hard than in soft water. In tests using green sunfish, *Lepomis cyanellus*, the chemical was significantly more toxic in water with a high pH (pH 9.0) than in the low pH water (pH = 6.0). Also, at a high pH of 9.0 the toxicant is detoxified at a faster rate. It was noted that some aquatic invertebrates are more resistant than fish to the toxicant. It seems that this chemical is a good candidate for use as a selective toxicant, but it is stressed that additional studies are needed to support a registration for its use.

76-0267. Logvinenko, V. F.; Shkvarnikov, P. K. (Inst. Molecular Biol. Genetics, Acad. Sci. Ukr. SSR, Kiev, USSR). **Fiziologicheskie i geneticheskie posledstviya obrabotki rasteniy granozanom. [Physiological and genetic consequences of plant treatment with granosan.]** *Tsitol. Genet.* 8(4): 313-316; 1974. (15 references) (Russian)

Physiological and genetic investigations of plants grown from wheat seeds treated with granosan powder at the normal dose (2 kg/ton) or with solutions containing 0.0012 to 0.09% granosan revealed the interference of this fungicide with growth processes, increased frequency of chromosomal aberrations (up to 13.2%), increased frequency of lethal mutations effect and genetic hazards of granosan not only in plants, but also in the human and animal organism. Therefore, the recommended dosage in seed treatment should be revised, and replacement of granosan by other, non-mutagenic preprations should be envisaged.

76-0268. Yashchuk, V. D. (Vinnitsa Fish Processing Plant, USSR). **Khlorofos v bor'be s daktilogirozom. [Chlorophos to control dactylogyrosis.]** *Veterinariya (Moscow)* 9: 74-75; 1974. (Russian)

Experience with the use of chlorophos (trichlorfon) to control dactylogyrosis in young carp in fish ponds is reported. Trichlorfon was added to the water at a rate of 0.81 mg/m³ (preparation with 85% active agent content) or at a rate of 1 mg/m³ (preparation with 65% active agent content). The carp were maintained in this water with 18-19°C temperature and pH 7.8-8 for two days. The animals were clinically healthy at the end of the treatment.

76-0269. Gladenko, I. N.; Trifonova, T. K.; Zaytseve, L. D.; Badiy, L. I.; Zhuravlev, V. M.; Sosa, N. N. (Ukrainian Sci. Res. Inst. Exper. Vet., USSR). **Patomorfologicheskie izmeneniys u ovets pri khronicheskoy intoksikatsii dikrezilom i trolenom. [Pathomorphological changes in sheep due to chronic dicresyl and trolene intoxication.]** *Veterinariya (Moscow)* 7: 88-90; 1975. (Russian)

Pathomorphological changes due to chronic poisoning with dicresyl and trolene were studied in sheep. Chronic poisoning of ewes with 1/50 of LD50, administered in capsules for 42-60 days, caused no clinical poisoning symptoms, nor essential hematological changes. The fetuses were normal, and there was no interference with the course of pregnancy and parturition. The organs and meat of sheep killed 2 months after the termination of a 2 or 3 month poisoning test with subtoxic doses of dicresyl or trolene were normal, but cooked meat and broth had a sour taste, and the meat was tougher than that of control animals. Pathoanatomical changes were found in different sections of the small intestine. The morphological changes in the small intestinal mucosa were most pronounced in sheep poisoned with dicresyl. Hyperplasia of the lymph follicles and proliferation of young, large, hemocytoblastoid cells were found in certain lymph nodes of sheep poisoned with trolene and dicresyl. Proliferation of the connective tissue, characteristic of hard fibroma, was observed in the ovaries.

76-0270. Evdokimov, E. S. (Turkmen Sci. Res. Inst. Livestock Farming and Vet. Med., USSR). **Fagotsitarnaya aktivnost' u krupnogo rogatogo skota pri otravlenii pestitsidami. [Phagocytic activity in cattle poisoned with pesticides.]** *Veterinariya (Moscow)* 7: 91-92; 1975. (Russian)

The effect of organochlorine pesticides on the phagocytic activity of the leukocytes against *Staphylococcus aureus* was studied in cattle. The phagocytic activity in cattle that had been treated with a 1% solution of trichlorfon externally for one year assumed an intermediate position between those of sick and clinically healthy animals. Sharp reduction of the phagocytic activity was observed in bulls treated with daily 200 mg/kg-doses of DDT and lindane internally for 5.5 months independent of the clinical manifestation of the poisoning. Considerable increase of the phagocytic activity was observed 2 months after termination of the experiment.

76-0271. Nikulina, S. S.; Sokol'skaya, N. P. (Azov Sci. Res. Inst. Fishery, USSR). **Vliyanie nekotorykh pestitsidov no ontogenez karpa. [Influence of some pesticides on ontogenesis of carp.]** *Veterinariya (Moscow)* 7: 94-95; 1975. (Russian)

The effect of DDVP (dichlorvos), carbophos (malathion), methylnitrophos (fenitrothion), and phosalone on the ontogenesis of carp was studied. Carp spawns treated with 0.01-10 mg/liter concentrations of DDVP and carbophos showed increased embryonal mortality, retarded development, and malformations indicative of the teratogenic action of these substances. The 0.01 mg/l concentration was ineffective. The LC50 concentration was determined to be 0.0015 mg/l for DDVP and 0.088 mg/l for carbophos. Doses over 0.1 mg/l caused 100% mortality. Ten-day-old larvae exposed to 0.01 to 1 mg/l concentrations of methylnitrophos and phosalone for 10 days showed attenuated food reflex, loss of appetite, reduced rate of cardiac concentrations, reduced gas exchange, and inhibition of the erythropoiesis. The LC50 values were determined to be 0.006 mg/l for methylnitrophos, and 0.058 mg/l for phosalone. The findings indicate the high toxicity of DDVP, carbophos, methylnitrophos, and phosalone at the early stages of ontogenesis of carp.

76-0272. Kalmykova, T. P. (All-Union Inst. Exper. Vet. Med., USSR). **Deystvie fenilmerkuratsetata na kletki kostnogo mozga sviney. [Effect of phenylmercuric acetate on bone marrow cells of pigs.]** *Veterinariya (Moscow)* 8: 91-92; 1975. (Russian)

Three piglets, 4.5 months old, were fed diets containing 5, 9, and 19 mg/kg doses of phenylmercuric acetate for 32, 22, and 12 days in a study on the effect of this fungicide on bone marrow cells. At the time when the first poisoning symptoms appeared, the animals showed 5.51% increase in aneuploidy, 1.45% reduction in polyploidy, and 5.49% reduction in the number of diploid cells, compared with the initial parameters. The number of metaphases with chromosomal aberrations increased by 485%. During the period of clearly manifest poisoning symptoms, the frequency of the chromosomal aberrations was 14.38±0.121%. Phenyl mercuric acetate also reduced the mitotic index from 9.5% to 4.5%.

76-0273. Lapchenko, V. S.; Vorob'eva, N. M.; Svatkov, V. I. (Kiev Sci. Res. Inst. Food Hyg., USSR). **Gigienicheskie aspekty izucheniya toksicheskogo deystviya na organizm smesi DDT i rogora. [Toxic action of a DDT and rogor mixture on animals.]** *Vop. Ratsion. Pitan.* 6: 137-140; 1970. (Russian)

The effect of orally administered mixtures of DDT and dimethoate, both at 1/40 and 1/80 of the respective LD50 values (7.5 and 3.75 mg/kg for DDT, and 6 and 3 mg/kg for dimethoate) was studied in male rats and compared with the effect of the same doses administered separately for 5-6 months. Compared with the groups fed DDT and dimethoate separately, the groups fed the pesticide mixture both at 1/40 LD50 developed weaker poisoning symptoms. No poisoning symptoms were found in the group fed a mixture of 1/80 of LD50 doses. There were no significant differences between the groups that were fed the pesticides mixtures and DDT and dimethoate separately regarding the serum and brain cholinesterase activities, the blood sugar level, the leukocyte and eosinophil counts, the weight coefficients of the liver, adrenal glands, and kidney. Significant increase was observed in the hepatic glycogen and vitamin C levels in rats fed dimethoate alone or in its mixtures with DDT. The increase in the hepatic cholesterol level was greatest in the groups fed pesticide mixtures. The findings indicate the predominant effect of DDT, which manifests itself in the clinical picture of the poisoning, in the increased levels of vitamin C in the liver and adrenals, of cholesterol in the liver, and in the weight coefficients of the liver and adrenals. Slight attenuation of the cholinesterase-inhibiting action of dimethoate by DDT was also observed.

76-0274. Vorob'eva, N. M.; Lapchenko, V. S. (Kiev Sci. Res. Inst. Food Hyg., USSR). **Nekotorye pokazateli funktsional'nogo sostoyaniya pecheni pri intoksikatsii preparatom antio. [Indexes of the functional state of the liver during poisoning with the preparation anthio.]** *Vop. Ratsion. Pitan.* 6: 141-144; 1970. (Russian)

The effect of orally administered anthio (formothion) on the functional status of the liver was studied in cats and rats in acute and subchronic experiments. Significant and persistent hyperglycemia was observed in cats after the administration of a single lethal 200, 300, or 400 mg/kg dose of anthio. Normalization of the blood sugar level was observed after 20 days. A toxic dose of 50 mg/kg caused no change in the blood sugar level. Increase in the hyperglycemic coefficient from 1.4 to 2.2 and increased duration of hyperglycemia was observed in cats poisoned with 22.2 and 11.1 mg/kg doses (equaling 1/10 and 1/20 of LD50) for one to two months, while the blood sugar levels remained within the physiological limits. These changes

are indicative of disturbances of the hydrocarbon-metabolizing function of the liver. Parenchymatous dystrophy of the hepatocytes and karyolysis were found in the liver of these animals. The sodium benzoate test in rats treated with daily 31.7 mg/kg doses of anthio, equaling 10% of the LD50, for 10 days revealed a 30% reduction in the urinary hippuric acid level, which indicates disturbances in the detoxification function of the liver under the effect of anthio.

76-0275. Svatkov, V. I. (Kiev Sci. Res. Inst. Food Hyg., USSR). **Vliyanie smesi sevina i fosfamida v porogovykh dozakh na giperklikemiyu pri vvedenii sakhara i adrenalina. [Effect of a mixture of sevin and phosphamide in threshold doses on hyperglycemia during the administration of sugar and adrenaline.]** *Vop. Ratsion. Pitan.* 6: 144-147; 1970. (Russian)

The effect was studied of threshold oral doses of carbaryl (5 and 2.5 mg/kg) and dimethoate (3 and 1.5 mg/kg), and of their mixtures (5 mg/kg of carbaryl, 1.5 mg/kg of dimethoate), administered for 40-70 days to female rats, on the glucose- and epinephrine-induced hyperglycemia. Reduction of the sugar-induced hyperglycemic peak relative to the control group was observed in the 5 mg/kg-3 mg/kg dose group. Significant hyperglycemic effect in the 5 mg/kg-dose of carbaryl, and of the 5 mg/kg 3 mg/kg mixture groups was observed at the end of the sugar stress when normalization of the blood sugar level was observed in the control group. General tendency toward an increased hyperglycemic effect of epinephrine was seen in groups treated with carbaryl, dimethoate, and their mixtures.

76-0276. Grigor'eva, N. N. (Dep. Pathoanatomy, Kiev Med. Inst., USSR). **Morfologicheskie izmeneniya shchitovidnoy zhelezy pri ostrom otravlenii polikhlorpinenom. [Morphological changes of the thyroid gland under the effect of polychloropinene.]** *Vrach. Delo* 5: 139-140; 1975. (6 references) (Russian)

The dynamics of the morphological changes occurring in the thyroid gland of rats after poisoning with a single LD50 dose (350 mg/kg) of polychloropinene was studied by microscopic, enzymatic, and biochemical methods. Significant reduction in the size of the follicles, cylindrical transformation of the follicular epithelium, and the presence of acidophilic colloids with large vacuoles were found during the first 10 days after poisoning. Histochemical examinations revealed increased RNA concentration in the cytoplasm of the follicular epithelium cells, and sharp decrease in the DNA concentration. Reduced RNA and DNA contents were found in the colloids. Equal rate of accumulation of neutral mucopolysaccharides and glycogen was found in the thyroid epithelium. Partial morphological and histochemical normalization of the thryoid gland was observed between 15 and 30 days after poisoning. The findings indicate the high sensitivity of the thyroid gland to polychloropinene.

76-0277. Komarova, L. I.; Lukaneva, A. M. (Dep. Exper. Pathol. Chem. Etiology, All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Pokazateli obmena leykotsitov pri ateroskleroze i vozdeystvii khloroganicheskihk pestitsidov. [Indicators of leukocyte metabolism in atherosclerosis and under the action of organochlorine pesticides.]** *Vrach. Delo* 6: 134-137; 1975. (9 references) (Russian)

The effect of cholesterol, lindane, and DDT on the metabolic processes and enzyme activities of peripheral leukocytes was studied in rabbits in a chronic experiment. The animals were given 0.2 mg of cholesterol per kg of body weight for 3.5 months; 5 mg/kg DDT with or without cholesterol, 1 mg/kg lindane with or without cholesterol for 8 months via stomach tube. A control group received sunflower-seed oil only. Significant increase in the lipid and free fatty acid contents in the leukocytes was observed in the animals treated with DDT (2.78 ± 0.06 and 1.53 ± 0.03, respectively, aginst 1.95 ± 0.11 and 0.88 ± 0.12 in the control group). The joint administration of DDT and cholesterol resulted in an even greater increase in these parameters. No similar changes were observed in animals treated with lindane or with lindane and cholesterol. The nonspecific esterase activity in the neutrophils and eosinophils of DDT-treated animals dropped from 2.07 ± 0.06 to 1.23 ± 0.06. Similar tendencies were also observed in animals treated with DDT and cholesterol and in those treated with lindane and cholesterol. Significant reduction in the glycogen level in the mature granulocytes from 2.19 ± 0.09 to $1,18\pm0.04$ was found after treatment with the pesticides and cholesterol. Reduction of the cytochrome oxidase activity of the leukocytes was observed in animals treated with DDT with and without cholesterol. A similar tendency was observed in animals treated with lindane and cholesterol. Significant reduction of the peroxidase activity was observed in animals treated with the pesticides and cholesterol.

76-0278. Onikiyenko, F. A.; Blakita, I. V. (Lab. Biochem., Kiev Inst. Occup. Hyg. Indust. Med., Kiev., USSR). **Izofermenty laktatdegidrogenazy krovi kak differentsial'nyj pokazatel' pri intoksikatsii karbaminovymi pestitsidami. [Blood lactate dehydrogenase isoenzymes as differential index of intoxication by carbamate pesticides.]** *Vrach. Delo* 7: 129-132; 1975. (7 references) (Russian)

The activity of serum lactate dehydrogenase (LDH) and its isoenzymes was examined in rats following treatment with a dithiocarbamate pesticide, polymarcin (mancozeb) and a thiocarbamate pesticide, Ro-Neet (cycloate). Polymarcin was administered in a single dose of 1000 mg/kg or for 2.5 mo at 95 mg/kg/day. Ro-Neet was administered in single doses of 500 and 1000 mg/kg or by inhalation for 4.5 mo at a concentration of 70 mg/kg. The general serum LDH activity increased after polymarcin was administered; a more marked increase was recorded in the activity of the "cardiac" isoenzyme LDH_1. Following Ro-Neet administration the rise in LDH activity was primarily attributable to increased levels of the "hepatic" isoenzyme, LDH_5. Thus the changes in isoenzyme concentration patterns are primarily due to specificity of the pathological changes occurring in intoxication with the pesticides rather than changes in the general LDH activity.

76-0279. Schroeder, G.; Dorozalska, A. (Inst. Chem. Prac. Anal. Chromatogr., Univ. Mickiewicza, Poznan, Poland). **Metabolizm DDT i jego analogow. [Degradation of DDT and its analogues.]** *Wiad. Chem.* 29(8): 553-565; 1975. (87 references) (Polish)

Studies of metabolic changes in the animal organism and soil are reviewed. Among the metabolic reactions of DDT thus far identified are 4 basic types: reductive dechlorination to DDT, dehydrochlorination to DDE, oxidation to kelthane (dicofol), and direct exchange of the CCl_3 group for CN, forming DDCN. In rat experiments with DDT several researchers found after 6 days a concentration ratio of 3:5:1 for DDT:DDD:DDE in liver and kidneys. In mice, the metabolite content was identical with that in rats. In pigeons, other investigators found DDD, DDE, and DDMU as DDT metabolites. Among bacteria causing DDT to change to DDD, *Proteus vulgaris* and *E. coli* must be pointed out; the latter compound is capable of degradation to DDE. In the rumen of ruminant animals, microorganisms metabolize DDT to DDD and DDE with the concentration of the latter differing from that in the tissues. While DDE degradation in the soil is accomplished by the catalytic action of iron and aluminum chloride, the enzyme dehydrochlorinase effects the same change in living organisms. The final product of DDT metabolism in mammals is DDA, mostly eliminated in urine and feces. The balance is either condensed or combined with the amino acids, serine and asparagine. Kelthane and DDCN were only isolated from insects. The latter was also found in anaerobic bacteria in the sludge of waste water. The action of the sun, heat, and moisture also results in DDT degradation. Under the effect of the sun's rays, DDT penetrates the lower and higher strata of the atmosphere from the earth's surface and is converted there into DDD in the lower and DDE in the higher layers by UV action. Synthetic insecticidal compounds, similar in structure to DDT, have been developed and a correlation between their structure and biological degradation was established. The studies discussed have led to a more sensible application of these pesticides and a lowering of their residue levels in foodstuffs.

76-0280. De Wilde, J. (Entomol. Inst., Landwirtschaftliche Hochschule, Wageningen, The Netherlands). **Insektenhormone und Insectenbekaempfung. [Insect hormones and pest control.]** *Z. Angew. Entomol.* 77(3): 279-286; 1975. (4 references) (German)

The effects, selectivity, and toxicity of juvenile hormones and juvenoid mimetics as potential tools in insect control are reviewed. Both juvenoid mimetics and juvenile hormones are highly selective, and certain insects may develop resistance to juvenoid mimetics. Juvenile hormones are digested in the normal fat digestion process in the warm-blooded organism. The LD50 of juvenoid mimetics, e.g., epoxyamides and dichloroamides of juvenile hormones, is over 10 g/kg body weight, which suggests that there are practically no toxicologic hazards to warm-blooded organisms.

See also **76-0150**

76-0281. Colas, A.; Royer, J.; Simon, R. (Service Analyses, I.R.Ch.A., Vert-le-Petit, France). **Identification et dosage des triazines dans les effluents. Comparaisons de la chromatographie sur couches minces et de la chromatographie en phase gazeuse. [Identification and measurement of triazines in effluents. Comparison of thin-layer and gas-phase chromatography.]** *Analusis* 3(7): 355-362; 1975. (26 references) (French)

Thin-layer and gas-chromatographic methods for the detection and determination of triazines in effluents are described and compared with each other. Following extraction with methylene chloride, the solvent is evaporated under vacuum at low temperature, and the residue is eluted with 9:1 mixture of chloroform and acetone for thin-layer chromatographic determination, using Brilliant Green or silver nitrate with phenoxyethanol before irradiation at 2,540 Angstrom for visualization of the spots. A cesium thermionic detector and Ucon 2000-impregnated Reoplex 400-filled column are used for gas-chromatographic determination. These methods are suitable for the detection and quantitative determination of simazine, atrazine, terbuthylazine, ametryne, metoprotryne, desmetryne, terbutryne, prometryne, and terbumeton. The sensitivity amounts to 500 ppb for the gas-chromatographic method and to 25 ppm for the thin-layer chromatographic method.

76-0282. Picer, N.; Picer, M.; Strohal, P. ("Rudjer Boskovic" Inst., Zagreb, Yugoslavia). **Determination of ^{14}C-DDT radioactivity in sea water and marine suspended matter by liquid scintillation.** *Bull. Environ. Contam. Toxicol.* 14(5): 565-570; 1975. (6 references)

Sea water samples were contaminated with ^{14}C-DDT of known activity and analyzed by scintillation counting. Even under conditions when the samples containing liquid scintillator (a Trifone and Insta Gel mixture) and sea water were turbid, the application of external standards made measurements reproducible. Using Trifone scintillator, satisfactory reproducibility was achieved with a solid phase of limestone or heated Adriatic sediment. However, with Adriatic sediment or Pacific or Mediterranean sediments, the data was not reproducible, probably because of the organic matter content of these samples. The reproducibility using InstaGel scintillator was fairly good with all samples. The use of InstaGel scintillator is suggested for the measurement of ^{14}C in the presence of solid particles and under conditions where the content of water in samples is relatively high.

76-0283. Maini, P.; Collina, A. (Pesticide Residues Lab., Cent. Exper. Res., Galliera, Italy). **Photochemically induced artifact in the analysis of soil for residues of organochlorine pesticides.** *Bull. Environ. Contam. Toxicol.* 14(5): 593-598; 1975. (15 references)

Samples of an agricultural soil from Modena, Italy were air-dried, extracted with 1:1 hexane/isopropanol, partitioned with water, and cleaned up on a Florisil column prior to concentration and analysis using an electron-capture Varian Aerograph 1520 gas chromatographic apparatus. Residues of the more commonly occurring organochlorine pesticides were found in the soil at concentrations ranging from 0.005 to 0.035 ppm. However, although the final cleaned-up extract was preserved at room temperature under daylight conditions, the height of the peak coincident with *p,p'*-DDT increased with time. To study this phenomenon, soil samples were extracted and cleaned up as described, then stored at -12 or 20°C in daylight or darkness prior to analysis. In the sample kept under daylight conditions at 20°C (sample A), the peak coincident with *p,p'*-DDT increased with time; this was not noted in samples kept in darkness and/or at -12°C. Treatment of sample A with sulfuric acid followed by Florisil cleanup resulted in removal of the spurious peaks. It is likely that the compound responsible for the spurious peak coincident with *p,p'*-DDT was photochemically induced.

76-0284. Wu, C. (Drexel Univ., Philadelphia, PA). **Investigation of liquid-liquid extraction parameters and development of a continuous liquid-liquid extraction apparatus for the analysis of organophosphate pesticides and other trace organics from aqueous environment.** *Diss. Abstr. Int.* 36(4): 1814B; 1975.

Partition coefficients of twenty primary parent organophosphate pesticides in four different types of water extracted with six different solvents are obtained. The *p*-values determined in distilled water are shown to be applicable to other types of water, including river water, sea water, and secondary sewage treatment effluent. Benzene was chosen to be the solvent for continuous liquid-liquid extraction study. A new continuous liquid-liquid extraction apparatus with capabilities for continuous solvent recycling and sample enrichment was development and laboratory tested. The design is a new conceptual approach to continuous liquid-liquid extraction. The principal parts of this design are a helix Teflon mixing chamber, a column phase-separator and a continuous sample evaporative concentrator and solvent recycling device. With the continuous liquid-liquid extraction, solvent recycling and continuous extract enrichment, pesticide solutions in the nanogram per liter concentration range were successfully recovered. Extraction efficiencies of 88 percent to 101 percent were obtained for four organophosphate pesticides. Exception was noted for parathion with only 58 percent extraction efficiency. Possible thermal breakdown of parathion was suspected. Preliminary tests of the apparatus for the extraction and recovery of organophosphate pesticides from fortified natural water solutions were also made with encouraging results. It is hoped that this continuous liquid-liquid extraction apparatus will be applicable to analysis of any trace organic molecules of public health or organoleptic significance. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 75-21,683.)

76-0285. Goeke, G. (Chem. Untersuchungsamt, 58 Hagen, Germany). **Rationelle Pestizid-Rueckstandsanalysen von tierischen Lebensmitteln durch Sweep-Co-Destillation und GC-Datenverarbeitung. [Efficient pesticide residue analyses of foods of animal origin by sweep codistillation and GC data processing.]** *Dtsch. Lebensm.-Rundsch.* 71(9): 309-314; 1975. (15 references) (German)

Improved pesticide residue analysis is described in foods of animal origin by sweep codistillation and gas-chromatographic data processing. The fatty crude extract containing the pesticide residues is injected into a continuous nitrogen stream sweeping a heated glass tube packed with sand, glass wool, and glass beads on which the lipids, other impurities, and pesticide residues are deposited. The pesticide residues are then eluted with petroleum ether or ethyl acetate to be condensed subsequently in a cryogenic trap. The residues thus collected are transferred onto a florisil or anacrom column for subsequent elution and admission into the chromatographic column. The pesticides are identified by means of their retention times relative to ethyl parathion or aldrin. The evaluation is substantially expedited and the accuracy increased by the combination of the gas chromatograph with the PEP-1 data processing system developed by Perkin-Elmer & Co. Relative to 1 ppm concentration, the recovery rates were determined to be 101% for hexachlorobenzene, 90% for α-BHC, 89% for lindane, 88% for δ-BHC, 90% for aldrin, dieldrin and endrin, 91% for α-chlordane and β-chlordane, 89% for *p,p'*-DDT, 70% for methoxychlor, 97% for bromomethyl hexachlorobicycloheptene, and 77% for Clophen A 60. Up to 10% of *p,p*-DDT is converted into tetrachlorodiphenyl ethane in the Storherr column in certain cases.

76-0286. Gorbacheva, N. A.; Smirnov, V. M. (Sci. Res. Inst. Forensic Med., Min. Public Health USSR, Moscow, USSR). **Izolirovanie i obnaruzhenie fosfamida (rogora) pri khimikotoksikologicheskom issledovanii. [Isolation and detection of phosphamide (rogor) in chemico-toxicological investigations.]** *Farmatsiyia (Moscow)* 243(2): 50-52; 1975. (9 references) (Russian)

A selective and sensitive thin-layer chromatographic method is described for the determination of phosphamide (dimethoate) residues in biological material, including nondecomposed cadaverous material. Following extraction with water acidified to pH 5 and reextraction with chloroform, the sample is cleaned up on a chromatographic silica gel layer, using a 1:1 ratio of hexane and dioxane. After reextraction with chloroform, dimethoate is determined on a silica layer with a 1:1 hexane:dioxane system, using palladium reagent and bromophenol reagent for visualization. The lower limit of sensitivity lies at 0.05 mg in 100 mg of biological material.

76-0287. Reichling, J.; Fischer, H. (Inst. Pharmazeut. Biol., Univ. Heidelberg, Heidelberg, Germany). **Einfluss verschiedener Polyamid-Chargen auf die duennschicht-chromatographische Trennung von Carbamat- und Phenylharnstoff-Pesticiden. [Influence of various polyamide batches on the TLC-separation of carbamate and phenylurea pesticides.]** *Fresenius' Z. Anal. Chem.* 276(4): 301-302; 1975. (8 references) (German)

The thin-layer chromatogrpahic separation of chlorbufam, propoxur, buturon, metobromuron, and carbaryl on polyamide 6 (ϵ-aminopolycaprolactam), polyamide 6.6 (polyhexamethylene diamine adipate), polyamide Woelm, and polyamide 11 (polyaminoundecanoic acid) layers was studied. It was possible to efficiently separate all substances on polyamide 11. Even the critical pair, metobromuron and carbaryl, could be separated on this polyamide by means of water methanol -methylethyl ketone in a 4:4:2 ratio. The separation of this pair was unsatisfactory on polyamide 6 and on polyamide Woelm, and it was impossible on polyamide 6.6. The phase reversal was sufficient for the positive separation of the substances on polyamide 11 only, which is due to the hydrophobic properties of this material.

76-0288. Franken, J. J.; Rutten, G. A. F. M. (Dep. Instrumental Anal., Eindhoven Univ. Technol., Eindhoven The Netherlands). **The analysis of chlorinated pesticides in natural samples by capillary columns and electron capture detection.** *Gas Chromatogr. Proc. Int. Symp.* 9: 75-88; 1972. (25 references)

Some aspects are discussed on the preparation and use of glass capillary columns, suitable for pesticide analysis in the nanogram range, using flame ionization detection, as well as in the picogram-range using the electron capture detector. Some results obtained with blood serum samples and with samples of surface water are presented as practical applications. When using an electron capture detector in combination with open-hole tubular columns for the analysis of chlorinated pesticides at the picogram level, special care must be taken of the undesirable adsorptive properties of the columns. Adsorption of the substances to be analyzed may seriously decrease the plate number and the quantitative yield, thus making the whole analysis questionable. The aromatic pesticides especially are prone to adsorption and decomposition. Conventional methods to deactivate the glass wall are not sufficient. The application of somewhat thicker layers of stationary phase, however, gave good results. Columns prepared in this way are suitable for analysis of pesticides at the picogram level.

76-0289. Brodtmann, N. V., Jr. (Jefferson Parish Water Dep., Jefferson, LA). **Quantitation of chlorinated pesticides—a comparison of methods.** *J. Am. Water Works Assoc.* 67(10): 558-560; 1975. (19 references)

A number of methods have been developed for the extraction, concentration, and cleanup of various classes of organic materials. A comparison has been made by parallel sampling of the qualitative and quantitative efficiency of the carbon abdsorption method (CAM) vs that of continous liquid-liquid extraction (LLM) in order to determine which method gave the most acceptable results. Acceptability was defined as that method giving the greatest frequency and variety of pesticides extracted and also the highest quantitative yields. Samples were taken from the Mississippi River water. The LLM detected pes-

ticides with a greater frequency than the CAM. The LLM resulted in about 11% more "hits" for the various pesticides than the CAM. The sampling costs per sample were $18.59 for the CAM and $9.84 for the LLM. Manpower costs were not included in this price as they were approximately equal for the two methods. It is concluded that, considering the documented disadvantages for the CAM such as adsorption-desorption variability and bacterial decomposition of sorbed compounds, the LLM is a more efficient method for the collection of extremely low quantities of pesticides from river water.

76-0290. Smith, B. B.; Dauterman, W. C.; Hodgson, E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Improved techniques for semi-micro synthesis of radioisotope labeled thiophosphate pesticides.** *J. Labelled Compounds* 11(2): 155-165; 1975. (23 references)

During the design of an improved procedure for the synthesis of radiolabeled diazinon, a process more generally applicable for incorporating radiolabeled alcohols into the thiophosphoryl center and for coupling the hydroxy-substituted pyrimidine or phenol to the phosphorochloridothioate diester was generated. By heating the radiolabeled ethanol with $PSCl_3$, the alcohol can be incorporated into the organophosphate molecule. Although lower yields are obtained, methanol can also be incorporated in this manner. By treating *O*-alkyl phosphorodichloridothionate with the appropriate sodium alkoxide, the *O,O*-dialkyl phosphorochloridothionates were produced. The catalytic effect of silver ions facilitated the coupling of the *O,O*-dialkyl phosphorochloridothionate to a substituted phenol to form the pesticidal compounds. The catalyzed coupling reaction proceeded through hydroxylated heterocyclic compounds, and with phenols containing nitro-, mercapto-, alkyl-, and cyano-substituents. However, the reaction was not successful with chloro-substituted phenols. The success of this coupling reaction in the formation of *O*-ethyl-*O*-*p*-nitrophenyl phenylphosphonothioate, EPN, indicates that the phosphonothionate insecticides can also be prepared by this manner. This method does not appear useful for the synthesis of oxons, the analogous phosphate compounds.

76-0291. Kosmatyy, E. S.; Chebot'ko, K. A.; Permyakova, N. M.; Samtsova, E. V. (Ukrainian Sci. Res. Inst. Plant Protection, Kiev, USSR). **Opredelenie dilora v pochve metodom tonkosloynoy khromatografii na plastinkakh "silufol". [Determination of dilor in soil by thin-layer chromatography on "Silufol" plate.]** *Khim. Sel'sk. Khoz.* 13(8): 25-26; 1975. (4 references) (Russian)

A thin-layer chromatographic method is described for the determination of dilor in soil, using "Silufol UV-254" plates (made in Czechoslovakia). After extraction with *n*-hexane, the extract is concentrated and the sample is applied on the chromatogrphic plate, using *n*-hexane as the mobile phase. The plate is treated with 2% diphenylamine solution in acetone, and irradiated with UV light for 5 min. Dilor is visualized in the form of dark blue spots with an Rf value of 0.36. It is possible to determine less than 10 μg of dilor in 100 g of soil by this method.

76-0292. Kislushko, P. M.; Guz, A. F.; Padenov, K. P. (Belorussian Sci. Res. Inst. Plant Protection, USSR). **Opredelenie fenmedifama v rasteniyakh, pochve i vode metodom khromatografii v tonkom sloe. [Determination of phenmedipham in plants, soil, and water by thin-layer chromatography.]** *Khim. Sel'sk. Khoz.* 13(8): 35-36; 1975. (Russian)

A sensitive thin-layer chromatographic method is described for the determination of phenmedipham in plants, soil, and water. After extraction, using *n*-hexane for plants, acetone for soil, and chloroform for water, the extract is concentrated by evaporation and the sample is applied on an alumina layer in benzene using 8:2 ratio of chloroform and benzene as a solvent system. The chromatographic plate is treated with 25% potassium hydroxide, and then with 3% solution of silver nitrate. Phenmedipham is visualized in the form of dark blue spots. Quantitative determination is possible for phenmedipham contents below 50 μg per sample. The recovery rate in plants ranges from 83 to 97%. The average recovery rates for soil and water are 87% and 95%. The lowest detectable quantity is 0.5 μg per sample. The Rf value is 0.6±0.05.

76-0293. Leshchev, V. V.; Abbasov, T. G. (All-Union Sci. Res. Inst. Sanit., USSR). **Opredelenie fosfamida v moloke i tkanyakh zhivotnykh s pomoshch'yu gazozhidkostnoy khromatografii. [Determination of phosphamide in the milk and tissues of animals by gas-liquid chromatography.]** *Khim. Sel'sk. Khoz.* 13(8): 56-57; 1975. (Russian)

A gas-liquid chromatographic method is described for the determination of phosphamide (dimethoate) residues in animal milk and tissue samples. Dimethoate is extracted from milk by means of acetone and 1% acetic acid, the solvent is expelled, and the dry residue is reextracted with chloroform. Chloroform is evaporated, and the residue is taken up in acetone for chromatographic determination. Acetone is used for extraction and reextraction from tissue samples, and distilled water and acetic acid are added for analysis. Chromatographic determination is done in a chromatograph with thermionic detector at a column temperature of 200°C, an evaporator temperature of 210-235°C, a nitrogen flow rate of 23 ml/min, a hydrogen flow rate of 14 ml/min, and an air flow rate of 400 ml/min. The quantity admitted to the column is 5 μliter. The detection is linear between 0.1 and 1 ng. The smallest detectable quantity is 0.1 ng, and the retention time is 2.3 min. The quantity of dimethoate is determined by peak height comparison with a standard. The sensitivity of the method amounts to 0.01 mg/kg. The recovery rate is 83±3% for milk and 73±3% for tissues.

76-0294. Bezkrovnaya, E. V.; Belonozhko, G. A.; Klisenko, M. A.; Sorokina, L. V.; Tovstenko, A. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, Kiev, USSR). **Opredeleniye soderzhaniya euparena v vinograde i zemlyanike metodom ton-**

kosloynoy khromatografii. [Determination of the content of euparen in the grape and strawberry by thin-layer chromatography.] *Khim. Sel'sk. Khoz.* 12(9): 603-604; 1974. (Russian)

A thin-layer chromatographic method is described for the determination of euparen and its metabolite, *N',N'*-dimethyl-*N*-phenyldiamide sulfate, in strawberries and grapes. Following extraction with benzene, waxes are eliminated by means of acetone, and reextraction is done with chloroform. The extract is dried by evaporation, and the dry residue is taken up in acetone and applied to a silica gel layer. Benzene and methanol (50:1), sulfuric acid, sodium nitrate with hydrochloric acid, naphthylamine, and dimethylformamide are used for the treatment of the chromatographic plate. Euparen and its metabolite appear in the form of raspberry-colored spots. The *Rf* values of euparen and its metabolite are 0.85-0.9 and 0.4-0.45, respectively. The limit of sensitivity of the determination is 0.02 mg/kg for euparen and 0.06 mg/kg for its metabolite. Many samples may contain more metabolite than euparen. After treatment of strawberry plants with 0.3 and 0.5% suspensions, no euparen was detected after 30 days. The euparen and metabolite contents in grapes were in the respective ranges of 0.22-0.68 mg/kg and 0.43-0.86 mg/kg 20 days after treatment at a rate of 1,000-1,250 l/ha.

76-0295. Solov'eva, E. I.; Lyubivaya, A. I.; Kabanova, N. N.; Stasishina, V. M. (Ukrainian Sci. Res. Inst. Canning Industry, USSR). **Opredelenie soderzhaniya ostatochnykh kolichestv karbofosa v ovoshchnom syr'e i konservakh. [Weight content of residual carbophos in raw fruit and canned goods.]** *Konserv. Ovoshchesush. Promyshl.* 11: 38-39; 1974. (Russian)

A thin-layer chromatographic method is described for the determination of carbophos (malathion) residues in fresh fruits and canned goods. Following extraction with hexane and reextraction with acetone and chloroform, the sample is applied on a chromatographic layer, using a 1:1 ratio of carbon tetrachloride and hexane in the chromatographic chamber. Visualization is done with a 0.5% solution of silver nitrate in UV light. The chromatographic method has a 71-80% accuracy.

76-0296. Odam, E. M.; Tarrant, K. A.; Townsend, M. G. (Pest Infestation Control Lab., Surrey, England). **Method for the elution of compounds from thin-layer chromatography plates.** *Lab. Pract.* 24(10): 670; 1975. (4 references)

An apparatus was developed which makes it possible to quantitatively recover microgram amounts of metabolites on a routine basis. A 25-cm long stem funnel was constructed from glass tubing to give a maximum diameter of 22 tapered to 2 mm. A plug of quartz glass wool was inserted and covered with a disc of glass paper, and a 20 cm glass tube bent into an L-shape was fitted with a silicone rubber sleeve and inserted into the wide end of the funnel. The tapered end of the funnel was connected to a vacuum pump and the gel in one band on the chromatography plate could be sucked into the stem as the L-shaped tube was moved over the plate. This tube was removed and the solvent used for the elution was washed through it into the funnel and collected. The apparatus was tested following the thin-layer chromatography of ^{14}C-warfarin and five in vivo metabolites. The total recovery of the ^{14}C-activity from each extract was greater than 90%.

76-0297. Scura, E. E.; McClure, V. E. (Scripps Inst. Oceanogr., Univ. California-San Diego, La Jolla, CA). **Chlorinated hydrocarbons in seawater: analytical method and levels in the northeastern Pacific.** *Marine Chem.* 3(4): 337-346; 1975. (9 references)

A study was undertaken to develop a method for analyzing small volume samples of seawater, i.e., 1 liter, for low levels of chlorinated hydrocarbons. The method calls for the pumping of seawater samples through a copper column containing a mixture (by weight) of 5% activated carbon powder, 10% MgO, and 85% refined diatomaceous earth. The column either absorbs or traps the chlorinated hydrocarbons and they are subsequently eluted with 30% benzene in acetone (v/v). Analysis is carried out by gas-liquid chromatography. The concentrations of chlorinated hydrocarbons in samples collected off the southern California coast were analyzed by this method. It is suggested that anthropogenic chlorinated hydroarbons can be used for the investigation of large-scale ocean currents and mixing processes. Samples from the seawater system from the fisheries center at La Jolla California contained an average of 2.9 pg/l of PCBs and less than 0.1 pg/l of total DDT. Surface seawater from the Gulf of Catalina contained < 0.1-4.6 pg/l of DDE and < 0.1-1.9 pg/l of DDT.

76-0298. Koeniger, M.; Wallnoefer, P.; Engelhardt, G. (Bayerische Landesanst. Bodenkultur Pflanzenbau, Abt. Pflanzenschutz, Germany). **Rueckstandsanalytischer Nachweis von polychlorierten Biphenylen (PCBs) in Gegenwart von Chlorkohlenwasserstoff-Pestiziden in Eiern von See- und Greifvoegeln. [Gas chromatographic determination of polychlorinated biphenyls (PCBs) in the presence of chlorinated hydrocarbon pesticides in eggs of sea birds and birds of prey.]** *Nachrichtenbl. Dtsch. Pflanzenschutzdienst.* 27(9): 131-135; 1975. (11 references) (German)

A method is described for the separation and gas-chromatographic determination of organochlorine pesticides in the presence of PCBs in rapacious bird eggs. Following extraction with acetonitrile and reextraction with petroleum ether, PCBs and organochlorine pesticides are separated a on silica gel plate by thin-layer chromatography using *n*-heptane as solvent. The substances separated and visualized by UV light are eluted from the plate with benzene and determined by gas-chromatography using an injector temperature of 225°C. By this method, it was possible to separate Clophene 60 and Arochlor 1268 almost quantitatively from the mixture of hexachlorobenzene, α-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, *p,p'*-DDE, *o,p*-DDD, and *p,p'*-DDT. Arochlor 1254 may be mistake for *p,p'*-DDE and heptachlor epoxide. Arochlor 1248 may be mistaken for lindane, heptachlor, and heptachlor epoxide, while Arochlor 1221 peaks appear immediately before the

α-BHC peaks. Aldrin and hexachlorobenzene were found in the PCB fraction. The thin-layer chromatographic separation of PCBs from organochlorine pesticides on silica gel layers can be regarded as reliable.

76-0299. Ohno, M.; Takano, T.; Baba, N.; Kirihata, M.; Kawano, K. (Inst. Chem. Res., Kyoto Univ., Kyoto, Japan). **A new assessment of the phosphoric acid method for pyrethrum assay.** *Pyrethrum Post* 12(3): 91-92; 1973. (7 references)

Substrate-structure selectivity of the color reaction of pyrethrins with phosphoric acid was investigated using pyrethrins I and II, jasmolins I and II, and *cis*-pyrethrolone and jasmololone. Five ml portions of the color reagent were added to 0.5 mg of each compound. The mixtures were heated at 100° for 2.5 min in a water bath. *Cis*-pyrethrolone and pyrethrins I and II produced a rose-red color, maximum absorption 550 nm. Jasmololone and jasmolins I and II produced no measurable color. Kenya pyrethrum flowers were assayed by the phosphoric acid method, using the 1972 World Standard Pyrethrum Extract (WSPE) as control. In samples showing a higher combined percentage of pyrethrins I and II than WSPE, a higher content of total pyrethrins than AOAC was also noted. These values were corrected by multiplying by the combined percentage of pyrethrins I and II in WSPE, divided by the corresponding percentage for the test sample as obtained by gas-liquid chromatography. Using this correction factor, fairly good agreement between the phosphoric acid and official methods was obtained. This completely eliminates the shortcomings of the phosphoric acid method for pyrethrum assay.

76-0300. Baluja-Marcos, G.; Franco-Soler, J. M. (Gen. Organic Chem. Inst., Juan de la Cierva Foundation, Madrid, Spain). **Influencia de algunas mezclas de fases de polaridad media en la deteccion multiple y en la degradacion termica de insecticidas organoclorados por cromatografia de gas-liquido. [Influence of certain mixtures of medium-polarity phases on the multiple detection and thermal degradation of organochlorine insecticides in gas-liquid chromatography.]** *Rev. Agroquim. Technol. Aliment.* 11(1): 152-160; 1971. (14 references) (Spanish)

In gas-liquid chromatographic detection of organochlorine insecticide residues and metabolites, the products of thermal decomposition occurring in the column (especially with endrin and *p,p'*-DDT) can be easily confused with the metabolites. The effect of a variation of operating conditions (column, detector and injector temperatures, nitrogen flow rate, etc.) was studied to determine optimum conditions for obtaining maximum separation of overlapping peaks but minimum thermal decomposition. This involves the utilization of medium-polarity phases. Tests were made with a Perkin-Elmer F-11 chromatography with electron-capture detector. Chromosorb W 80-100 was the usual substrate. Data is given for 5 different phase mixtures and 17 sets of conditions. Best results were obtained from 3 out of 4 sets of conditions utilizing a mixture of polybutylene oronite and QF-1; also 2 out of 4 employing DC-200 and QF-1.

76-0301. Tchan, Y. T.; Roseby, J. E.; Funnell, G. R. (Dept. Microbiol., Univ. Sydney, New South Wales 2006, Australia). **A new rapid specific bioassay method for photosynthesis inhibiting herbicides.** *Soil Biol. Biochem.* 7(1): 39-44; 1975. (23 references)

The development is reported of a rapid bioluminescence method capable of determining low concentrations of photosynthesis inhibiting herbicides in water and soil. This method is based on the effect of herbicides on the oxygen produced by photosynthesis. The amount of oxygen is estimated by the bioluminescence system of photobacteria. To evaluate the potential of the method as a bioassay technique, a series of photosynthesis inhibiting herbicides were tested: diuron, neburon, monuron, and atrazine. Diuron concentrations of 0 to 0.8 ppm were used. One hundred ml of a suitable algal culture was exposed to the herbicide for 30 min under illumination. It was then centrifuged and used in the assay. The results were expressed as a percentage of the light emission of the control tube containing no herbicide. Similar experiments were conducted for the other herbicides. The concentrations causing 50% inhibition were (in parts/10^8): diuron, 6.5; neburon, 10; and monuron, 62.5. With atrazine the incubation prior to centrifugation was extended to 90 min and 50% inhibition was attained with 3 ppm. Tests were also performed to assess the practical application of the method to the soil environment. The adsorption of diuron in soils was studied. The method proved rapid and sensitive, being capable of estimating herbicide concentrations of 2 parts/10^8 within an hour. The high specificity of the reaction allows this technique to be used directly without any extraction or purification of the herbicide from the samples.

76-0302. Kuwarsuka, S.; Michiyo, I. (Dep. Agric., Nagoya Univ., Nagoya, Japan). **[Degradation of PCP in soils. Part I. Quantitative analysis of PCP in soils.]** *Nippon Dojo Hiryogaku Zasshi (J. Sci. Soil Manure Jpn.)* 45(7): 321-326; 1974. (19 references) (Japanese)

An analytical technique is described for determining PCP (pentachlorophenol) in soils using solvent extraction followed by colorimetry and gas chromatography. The soil samples were first acidified with concentrated hydrochloric acid, then extracted with benzene. The benzene phase was washed with water and then back extraction was performed with 0.1 N sodium hydroxide. The PCP in the NaOH solution was further extracted into xylene, with 2% 4-aminoantipyrine in the presence of 10% potassium ferricyanide, and the absorbance of the xylene phase at 574 nm was used to determine the PCP. The effect of the benzene extraction time was studied, and 97 ± 2% of the PCP in soil could be collected by 4 hr extraction, depending on the type of soil used. The optimum pH for back extraction was examined, based on the absorbance of the xylene phase. The absorbance was almost the same for back extraction at pH values of 5-10.5, which indicated that the interference of phenolic compounds in the colorimetric determination of PCP with 4-aminoantipyrine could be minimized by back extraction from acidic solution. The calibration curve for PCP colorimetric determination was linear up to 7 μg PCP/ml xylene. The PCP

extracted in benzene could be directly determined by gas chromatography using a DECG-H3P04 (D-29) column with 2,4,6-tribromophenol as the internal standard. Since no methylation of PCP is needed in the gas chromatographic determination, a number of soil samples can be analyzed in a short time, and PCP can be determined even in the presence of methyl esters. The simultaneous determination of other chlorophenol compounds such as trichlorophenols and tetrachlorophenols was possible after the initial benzene extract was washed with water and back extraction with 0.5 *N* NaOH was performed. After acidification of the NaOH phase with concentrated HCl, a second extraction with benzene was performed and the benzene phase was injected onto the GC. The determination of 1 ppm PCP by gas chromatography entailed a fairly large error. Such a low level of PCP, however, could be detected by the present method if the amount of benzene used in the benzene extraction is reduced.

76-0303. Malinin, O. A. (Ukrainian Sci. Res. Inst. Exper. Vet., USSR). **Opredelenie sevina i produkta ego metabolizma v mozhe.** [**Study of sevin and its metabolic products in urine.**] *Veterinariya (Moscow)* 7: 92-94; 1975. (Russian)

A colorimetric method is described for the determination of carbaryl and its chief metabolite, 1-naphthol, in urine. After the addition of acetic acid and lead acetate, extraction is done with with *n*-hexane. The substances are then reextracted with ethanol. Conjugates of carbaryl and 1-naphthol are hydrolyzed with hydrochloric acid before extraction. For colorimetric determination, the same is combined with 10% potassium hydroxide solution and diazo color system (dimethyl-para-phenylenediamine sulfate with 1 *N* hydrochloric acid and 2% sodium nitrite). Boric acid is added for the determination of 1-naphthol. The sensitivity of the method amounts to 0.15-0.20 mg/liter for carbaryl and 1-naphthol and 0.3 mg/liter for conjugated carbaryl and 1-naphthol. The recovery rate amounts to 75%.

76-0304. Kussmaul, H.; Hegazi, M.; Pfeilsticker, K. (Inst. Wasser-, Boden- Lufthyg., 6 Frankfurt am Main, Germany). **Zur Analytik von Phenylharnstoff-Herbiziden im Wasser. Gaschromatographische Bestimmung der Wirkstoffe und Metaboliten.** [**Analysis of phenylurea herbicides in water. Gas chromatographic determination of these substances and metabolites.**] *Vom Wasser* 44: 31-47; 1975. (17 references) (German)

A gas-chromatographic method was developed for the determination of fluometuron, fenuron, buturon, monolinuron, monuron, metobromuron, neburon, linuron, diuron, chlorbromuron, and metoxuron in water. Results of systematic analyses of groundwater, surface water, and drinking-water samples for aromatic amines and phenylurea herbicides are presented. After extraction and clean-up (the latter step is necessary for surface water samples) the residue is dissolved in acetone and hydrochloric acid is added to form substituted anilines. Acetone is expelled, and after hydrolysis at 160°C, the Sandmeyer reaction is carried out for subsequent gas-chromatographic determination of the amine products with an electron capture detector or nitrogen-specific detector. The recovery rate was found to decrease with increasing water solubility. Four metabolites of phenylurea derivatives were identified in surface water, namely 3-trifluoromethylaniline, aniline, 4-chloroaniline, and 3,4-dichloroaniline. While these compounds originate mainly from industrial effluents, they may also be present as metabolites of fenuron (aniline), fluometuron (3-trifluoromethylaniline), buturon, monuron and monolinuron (4-chloroaniline), or neburon, linuron, and diuron (3,4-dichloraniline).

76-0305. Konobu, K.; Takeda, T. (Osaka Coll. Pharm., Osaka, Japan). [**Microassay for blood cholinesterase activity by fluorometric titration.**] *Yakugaku Zasshi (J. Pharm. Soc. Jpn.)* 95(8): 906-910; 1975. (7 references) (Japanese)

An improved method for the microassay of blood cholinesterase activity, based on fluorometric titration of acetic acid, was described. The reaction mixture (100 μl substrate, 50 μl Tris buffer of pH 7.6, and 50 μl specimen) was incubated for 10-20 min at 30°C. Added to this mixture is 1000 μl isopropanol solution of umbelliferone at 1.0 μM. After centrifugation, a 1000 μl aliquot of the isopropanol supernatant, containing 0.20-15 μmole acetic acid, was titrated by fluorometry with 0.02 *N* isopropanolic sodium hydroxide. Linearity of the reaction rate was obtained with in 40 min of incubation. The present method is applicable to colored and insoluble specimens, such as erythrocytes, in the same way as in the case of serum.

76-0306. Filimonova, M. M.; Gorbunova, V. E.; Filimonov, B. F. (Author address not given). **Polyarograficheskoye opredeleniye 2,6-dinitro-*N*,*N*-dietil -4-triftorometilanilina v vode i ovoshchak.** [**Polarographic determination of 2,6-dinitro -*N*,*N*-diethyl -4- trifluoromethylaniline in water and vegetables.**] *Zh. Anal. Khim.* 30(2): 358-362; 1975. (12 references) (Russian)

Polarography of 2,6-dinitro-*N*,*N*-diethyl -4- trifluoromethylaniline (the herbicide nitrofor) employs an eight-electron wave produced by reduction of nitro groups to hydroxylamino groups. Two four-electron waves are observed at pH 7-11 in a 0.05 *N* solution of tetraethylammonium iodide in dimethylformamide. These waves correspond to stepwise reduction via nitrohydroxylamine. The polarogram at pH > 11 in 0.05 *N* KCl (LiCl) solution contains three waves. Procedures are described for polarographic determination of nitrofor in water, tomatoes and tomato juice, and cabbage. Sample workup is simple, comprising extraction with hexane or methanol, and requiring alumina column chromatographic cleanup only in the case of tomato.

See also 76-0099 76-0107 76-0119 76-0150 76-0215 76-0283 76-0297

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